SCIENCE

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THE ENDOWMENT OF RESEARCH.

Is investigation in the physical sciences now limited by the lack of men or money? In other words, is it limited by the insufficient number of investigators capable and ready to do work of the highest grade, or are they unable to secure the means needed to carry on such work? The income of several funds is available for aiding such investigation. In 1797, Count Rumford gave to the American Academy the sum of $5,000, for awarding gold and silver medals for discoveries in light and heat. Until recently, so little use has been made of its income that this fund now amounts to $58,000. The annual income, which exceeds $2,500, may be used for researches in light and heat. The Elizabeth Thompson fund, amounting to $26,000, according to the last circular issued, may be used for investigations in all departments of science. Seventy-one grants have been made from the income of this fund, generally in sums not exceeding $300. Several funds, held in trust by the National Academy of Sciences, show unexpended balances equal to the income of several years. Thus, at the beginning of the present year, the Henry Draper fund of $6,000 had an unexpended balance of more than $2,000 available for investigations in astronomical physics, and no applications had been received for it. In 1886, the writer attempted to secure the sum of $100,000, the income to be used for

aiding astronomers of all countries in their work. Miss Bruce, in 1890, besides her numerous other gifts to astronomy, gave the sum of $6,000 to be distributed in this way. The 15 donations are described in a circular issued in 1891. Many investigations require such large sums of money that they could not be provided for by such funds as these. On the other hand, a small sum judiciously expended sometimes leads to much larger gifts, and may furnish an observer with an instrument, an assistant, or means for publication. A small gift may thus render available, resources of vastly greater value which would otherwise lead to no useful result. For instance, the writer in 1882 received an appropriation of $500 from the Rumford fund, for an investigation in astronomical photography. Presenting the results of this work to the trustees of the Bache fund, he received an appropriation of $3,000, with which an 8-inch photographic telescope was constructed. Twenty-six thousand photographs have since been taken with this instrument which for many years has been used throughout every clear night at the Arequipa Station of the Harvard College Observatory. The early results were presented to Mrs. Henry Draper, who accordingly had a similar 8-inch telescope constructed. This instrument is used here throughout every clear night, on the northern stars, thus supplementing the work of the Bache telescope. With this instrument, also, 26,000 photographs have been obtained. The early results of the Henry Draper Memorial led to the transfer of the Boyden fund, exceeding $200,000, to the Harvard College Observatory, and also to the gift of $50,000 by Miss C. W. Bruce, with which a 24-inch telescope, now successfully at work in Arequipa, was constructed. The results attained by each gift thus helped to secure the next. Again, an appropriation of $500 from the Rumford fund, in 1899, enabled the Directors of the Yerkes, Lick, McCormick and Harvard observatories to cooperate, so that telescopes of 40, 36, 26, 15, and 12 inches aperture are now being used in the same research on the light of very faint stars. The value of the plant utilized in this research exceeds a million dollars. It is hoped that similar cooperation can be secured in continuous observations of the variable stars of long period. In many cases an award of a small sum to an observatory will assure its friends of the value of the work and thus encourage them to contribute liberally. It is believed by the writer that the real difficulty lies in the lack of knowledge of what funds are available, diffidence in presenting applications, and in some cases objection to the restrictions under which the grants may be made. Could these difficulties be remedied by a permanent committee, and if so, how should it be appointed? In no country have such sums of money been given to science as in the United States; in fact, the success so far attained and our future prospects for research depend largely upon such gifts. It is believed that in many cases wealthy men and women would gladly aid scientific investigation if they could be sure that their gifts would be judiciously and economically expended. It is, therefore, of the greatest importance to all scientific men, not only to secure aid for important researches, but to prevent, if possible, the unwise or wasteful expenditure of such money. The writer desires to learn the views of others on this matter, either through the columns of Science, or by personal correspondence.

Edward C. Pickering.

Cambridge, Mass., January 25, 1901.

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*RESEARCH WORK FOR PHYSICS TEACHERS.**

The teaching of physics is in itself a delightful thing, but to be thoroughly enjoyed

* An abstract of a paper read before the Physics Club of New York, December, 1900.

it should be plentifully seasoned with research. Science in the past has been indebted in a very great measure for its progress to the teaching class. An inquiry into the statistics of this subject, which I had occasion to make some years ago, and in which I attempted to classify the professions of all the authors up to the middle of the present century, who are sufficiently known to have found a place in the pages of Poggendorff's Dictionary, showed that nearly 90 per cent. of the scientific work of the world had been done by teachers. The remainder was divided almost equally between the members of the medical profession and the clergy. Law was found to be almost entirely unrepresented, the most notable instance of a lawyer who has left a name in science being that of Bacon. There has been of course a considerable number of amateurs in science, and the list contains some famous names, such, in physics, for examples, as Joule in England, and Holtz, Elster and Geitel in Germany; but taken numerically this class shows a very small percentage in the tables. Great as the attainments of the teacher in investigation have been when compared with those of the remainder of the community, the statistics show that in this country at least not more than ten per cent. even of college men engaged in the teaching of physics can be counted as belonging to the ranks of the producers. I have been unable to extend the inquiry to physics teachers in secondary schools, not through any difficulty in enumerating those whose names appear in scientific authorship, but through ignorance as to the total number who are engaged in teaching the subject in the United States. It is clear, however, that the ratio would be even smaller than in the case of those who are teaching in our colleges and universities.

That there are very great and very real difficulties any one who has attempted to carry on research and teaching at the same time must admit. The principal excuses offered for the abandonment of any attempt at scientific performance are *lack of time*, *lack of apparatus* and *lack of the necessary qualifications for the work*. A comparison of college teachers with the teachers in the secondary schools in these respects has led me to the opinion that the differences of opportunity are much smaller than is commonly supposed. Science teachers, both in the college and in the school, are unquestionably overworked. The tax upon the nervous system of the proper teaching of science is very great, and it is more often the want of surplus energy with which to carry on investigation, than lack of actual time or of the necessary equipment that defeats us. The actual number of hours demanded of teachers is small as compared with that required by many other callings; so much so, that by the outsider the teacher is apt to be regarded as belonging to the leisure class; but measured in terms of vital energy those hours, as we all know, are quite long enough.

The plea of lack of qualification for research is one which the college man feels less free to make than does the teacher in the secondary schools; because he knows that whether he has such qualifications or not he is at least supposed to possess them; whereas it has not yet been demanded of secondary school teachers that they should be capable of actual scientific productiveness. This difference of standard I believe is a false one and most unfortunate; for it is certainly more difficult to teach successfully the beginnings of a subject than to conduct advanced work. The real explanation of the comparative unproductiveness of secondary school teachers lies, I am convinced, in the absence of *the habit of investigation*, a habit which like all others must be acquired by practise and maintained by continued practise. Research flourishes

only in a certain atmosphere, and this atmosphere is to be found only where scientific work is going on. Some little corner of time can always be found even by some of the most overburdened of us, and as to equipment, it should not be forgotten that the scientific appliances at command of the school teacher of the present day are greatly superior to those of the average college man of a generation ago, and are not greatly behind those of the average college man of the present. Yet there was great scientific activity in certain localities at a time when laboratories, as we know them, had not yet come into existence. Men are still living who can remember when the first chemical laboratory in Germany was established by Liebig, and one need not to be very old to look back upon the beginnings of laboratory instruction in this country.

Qualification for research must always be acquired by individual effort. Any one who is really fit to teach science has at least the latent gift necessary to the investigator. To develop the gift he must, however, cultivate the habit of scientific reading and the habit of experimentation. The number of science journals is now so great that no one can longer pretend to read them all; but we have in the admirable summary entitled, *Science Abstracts*, and in *Wiedemann's Beiblätter*, the results of the whole world of physics presented in brief form. One of these two journals should be taken by every physics teacher, and in addition he should subscribe to and read some one of the standard journals devoted to his subject.

Given a well-developed habit of experimentation, it only remains to select some topic and to study that persistently to the point of obtaining definite results before taking up another. All subjects for investigation are not equally within the reach of the teacher in the secondary schools. We can not, for example, expect to duplicate in our laboratories the thousands of storage cells necessary to the carrying on of the researches upon which Professor Trowbridge, of Harvard University, is engaged, nor to lay out large sums for apparatus of any other kind. As a rule, the apparatus necessary to an investigation is, however, not very expensive; certain standard instruments, such as the balance, the thermometer, the spectroscope and the galvanometer, are to be found in every decently equipped school at the present day, and work of the highest interest can be done by supplementing these with special apparatus which may be either home-made or may be obtained at a small cost by employing our ordinary artisans.

The following suggestions of topics for research which may be pursued without elaborate or unusual apparatus in the spare time of any one who possesses the intense love of experimentation, characteristic of the true man of science, may serve to show that there is no lack of material within the reach of every ambitious physics teacher.

The temperature at which pure water reaches its maximum density has been carefully determined, and it is known that the introduction of a gas such as ammonia, which is largely absorbed by water, or of a salt in solution like sodium chloride, or of alcohol or sulphuric acid, not only lowers the freezing point and changes the density of the liquid, but that the point of maximum density falls, as the amount of added substance is increased, more rapidly than the freezing point itself; until finally the phenomenon of maximum density disappears altogether. Any one who possesses a good thermometer reading to low temperatures or who has sufficient skill and experience to make and calibrate a thermo-junction can readily extend this investigation to solutions and mixtures not yet studied. The only instruments required for such investigation, aside from the usual laboratory utensils, are a good thermometer and a

Fahrenheit hydrometer, or a hydrometer of the variable immersion type with the diameter of the neck reduced to the least practicable size. The work is of sufficient delicacy to tax the manipulative skill of the observer, and the investigation is on this account worth the doing simply as practise work, while the results of a careful study of the subject would be welcomed by any of our standard journals of physics. By a similar method, studies may be made of the density and coefficient of expansion of liquids having low freezing points, such as alcohol, ether and carbon disulphide. Something has been done in this line, but the subject is far from being exhausted. By the use of liquid carbon dioxide and ether one can readily reach the temperature —80° C., and it is probable that the time is near when liquid air will be available for the extension of such work to much lower temperatures. Data upon subjects such as these are useful even though no startlingly new phenomena be brought to light, and the observer has before him the possibility of discovering new and important relations which may have a bearing upon our theories of the nature of matter. The verification through this extended range of temperatures, viz., from —80°, and ultimately from —200°, upwards, the law already theoretically established by Van der Waals* for the relation of the expansion of liquids to their critical temperatures; or, failing in that, the experimental demonstration of the necessity of a modification of the theory, would be in itself ample incentive for the investigation.

The subject of specific heats at low temperatures is still awaiting the attention of our experimental physicists. H. F. Weber† a quarter of a century ago studied boron and silicon, in this respect, down to —40° C. and carbon to —50° C., with most interesting results, after which comparatively little was done until 1898, when Behn* obtained values for several metals down to —200°. The specific heat of a great variety of solids and liquids still remains to be determined through the greater range of temperatures now within our reach, and the calorimetric observations are no more difficult nor elaborate at low than at high temperatures. Any one who can set up and calibrate a Bunsen ice calorimeter is in position to make the measurements. A cylinder of carbon dioxide and a can of ether will give refrigeration to —80° C. and perhaps by the time the work for this range of temperatures is completed it may be possible to order a gallon of liquid air by telephone at a reasonable cost and thus readily extend the research to —200° C. Temperature measurements are best made in such work by finding the change of resistance in a coil of fine copper wire.

What I have attempted to point out, in a fragmentary way in the case of two or three particular problems is true of the whole domain of physics. No research is ever complete. However exhaustive it may at first sight appear, it will, when critically considered, be found to afford merely a starting point from which to push further out into the infinite region of the unknown which lies beyond the boundaries of our present knowledge. Every theoretical discussion is based upon assumptions which must be tested experimentally, and such tests usually lead to new and more accurate knowledge of the properties of matter and ultimately to modifications of the theory. Thus Poisson, long since, pointed out that the numerical value of the ratio for the relative contraction of the diameter of a stretched rod to the elongation would be one-fourth for all substances for which the assumption

* Van der Waals, 'Continuität des gasförmingen und flüssigen Zustandes.' Leipzig, 1881.

† H. F. Weber, *Poggendorff's Annalen*, 154, pp. 367 (1875).

* Behn, *Wiedemann's Annalen*, 66, pp. 237 (1898).

made in his theory of elasticity holds true. Measurements, however, showed widely varying values for Poisson's ratio and led to important modifications of the theory. All this may be thought to belong to the ancient history of the science, but to-day, after nearly half a century, exact data are known for only a few substances. I do not mention this as one of the determinations especially adapted to the secondary school laboratory. The quantity to be observed is, of course, exceedingly small. Still the method by which I am accustomed to illustrate the phenomenon to my classes; that of stretching a glass tube filled with mercury and noting the fall of the liquid in the very fine capillary neck gives a good result with glass, and would probably be adaptable without serious difficulties to such other materials as can be obtained in the form of tubes. With the interferometer, direct measurements of the change of diameter ought to be readily made but this instrument is at present not a part of our school equipments.

Another field of work which is easily opened to physics teachers in our secondary schools is that of the study of flame temperatures. The temperatures of the Bunsen burner, the ordinary luminous gas flame, the candle flame and the acetylene flame are already pretty well established, although many important details which are capable of being worked out by a patient observer are still lacking. When it comes to the question of other flames than these, we have only the wildest estimates based upon measurements made by methods, the inadequacy of which has been abundantly demonstrated. The flames of alcohol, of ether and of carbon disulphide burning in air would afford subjects for an interesting and profitable study during one's leisure hours. The apparatus needed for such a research consists of a fairly sensitive galvanometer, a resistance box and a standard cell, together with about one meter each of platinum and platinum-rhodium wire. The obstacles to even approximately accurate high temperature work have until recently been almost insuperable on account of the difficulty of calibrating the thermo-element used; but I have shown in a recent paper* how the very elaborate and laborious methods of calibration hitherto employed by those engaged in such work may be avoided without loss of accuracy and how by the ingenious method first employed by Waggener† in the study of the Bunsen burner, and subsequently by myself for the measurement of the acetylene flame, the heat losses in the thermo-junction which had vitiated the results of earlier observers may be eliminated.

We physics teachers have amused ourselves at one time or another, like many other people, with photography, and a few of us, doubtless, deserve to be classed as experts in the fascinating art. Herein lies a double opportunity for research; in the further development of the science which underlies photographic processes and in the application of the photographic method to the numerous problems in physics to which it is especially adapted. Consider, for example, in illustration of the former, the fruitful field of inquiry suggested by Professor Nipher's‡ recent memoir upon the action of light and of the X-rays on previously exposed plates, and of the latter the countless investigations of recent years in which the photographic plate has been utilized for recording and studying the phenomena of our science.

By means of a camera containing a revolving drum, upon which a piece of the flexible film used in the making of ani-

* Nichols, *Physical Review*, Vol. X., p. 324.

† Waggener, *Wiedemann's Annalen*, Vol. LVIII., p. 579.

‡ Nipher, *Transactions of the St. Louis Academy of Sciences* (1900).

mated pictures may be mounted, a great variety of interesting work may be performed. Professor Merritt* and I have shown in a recent paper that very beautiful photographs of the manometric flame are obtainable with the aid of such an instrument, and Professor Hallock has made use of a similar method in an extended analysis of the human voice. Any one who has the patience to systematically study and interpret records of this sort, might add greatly to our knowledge of the physics of articulate speech. With the same instrument the motions of vibrating strings and rods and the decadence of overtones with the time may be studied. The instrument is, indeed, applicable to a very great variety of short-time phenomena, such, for example as the duration of exposure obtained by various flash powders, a subject of which at present our knowledge is very incomplete.

Still another interesting line of work within the reach of physics teachers in our secondary schools consists of the photography of the infra-red spectrum. Becquerel showed many years ago that the fluorescence of calcium sulphide and other substances could be checked and almost annihilated by the long waves of the spectrum, and Fomm, a student of von Lommel, in 1890 succeeded in photographing the infra-red spectrum of the sun by placing a fluorescent screen in the spectral image and subsequently making a contact print by laying the screen face to face with an ordinary sensitive dry plate. In this way he was able to identify and determine the wave lengths of numerous dark lines in the spectrum. The absorption spectra of chlorophyll, of water, of the salts of didymium, samarium, erbium and of other substances which possess well-marked bands in the visible spectrum, have been mapped in this way by Becquerel, but his work should be repeated since his estimation of wave-lengths is known to be entirely at fault. The number of substances as yet untested is very great and the accurate investigation of them might lead to results of high importance. The method of direct photography by means of plates sensitized for the infra-red is probably to be preferred for such work, to the troublesome use of the fluorescent screen.

Finally, not to extend this list of feasible experiments further, permit me to remind my fellow teachers of physics that we have in the spectro-photometer, an instrument by means of which one may investigate visible radiation, reflecting power and the transmission of light, by all sorts of substances. It is a great convenience in such work to have at hand the very perfect modern instruments designed by Lummer and Brodhun or by Brace. I am aware that none of our school laboratories are likely to contain such apparatus; but it is only necessary to purchase a Vierordt slit and to adapt the same to any good ordinary spectroscope in order to be in position to do good spectro-photometric work.

I have attempted in this paper to mention only a few of the numerous topics of research available for physics teachers. It is one of the characteristics of our science, that every contribution to our knowledge brings with it a group of further problems to be solved. One can not read intelligently any memoir describing experimental work without perceiving the possibility of extending the investigation further. The one essential requisite to the carrying out of the suggestions thus received is that burning desire to try things for one's self which characterizes the investigator. Such a desire is the fruit of that habit of experimentation to which I have already referred, a habit which I deem it the first duty of every one, who has the ambition to lay claim to the title of man of science, to foster and

*Nichols and Merritt, *Physical Review*, Vol. VII., p. 93.

cultivate. Given this desire for research, which is the inevitable result of the habit of experimentation in every one whose mind is fit for scientific pursuits, and all other difficulties, those of time, opportunity and equipment can be overcome. Certain lines of investigation which one would gladly follow must indeed be abandoned for lack of means with which to pursue them; but he who keeps alive his knowledge of scientific progress by the systematic reading of the literature of first sources need never lack topics of research.

The proper stimulus for scientific work is the love of experimentation for its own sake rather than any desire or expectation of fame; the delight of witnessing the wonderful performances of matter under conditions conceived and imposed by ourselves, rather than the hope of achieving some momentous result. At the same time we should not forget that the very simplest phenomenon of nature is worthy of our closest, even of our reverent attention and that some experiment as seemingly unimportant as the shooting of quartz fibers, may, like that now famous operation of a fellow teacher (Boys), be ultimately of inestimable value to science.

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ON ECLIPSE PHOTOGRAPHY.

Some months ago the writer suggested that the dangers of over-exposure in photographing eclipses might be avoided by a long exposure covering the entire totality of the eclipse, and a development of the plate as a positive in the light. Since that time the interval of exposure in the camera has been considerably reduced by increasing the illumination of the plate while in the developing bath. Plates can with proper exposure be developed in direct sunlight, with a reflected beam of sunlight also thrown down upon the plate. But while such pictures leave nothing to be desired for clearness and sharpness of detail, they do not show any details which can not be brought out in a negative. Moreover, the exposure required to produce a good positive is still rather too long to make this method in its present condition seem of much advantage in eclipse work.

But it has also been found that the developer best suited to producing fine positives will develop beautiful negatives in the dark-room, on plates that have been over-exposed as much as two thousand times. Such plates thus exposed may be developed either as negatives in a perfectly dark room, or as equally good positives in a light room, and with the same developer. Where the normal camera time is a tenth of a second, the exposure may be as great as three minutes and a half, and still secure a sharp crisp negative. With greater exposures it is better to develop the plate as a positive in the light room.

The developer recommended, as the best so far tried, is hydrochinone made up according to Cramer's formula, with the bromide left out. The sodium carbonate solution may be made up at half the strength given in the formula if the developing is to go on slowly. To half an ounce of the mixture of solutions one and two, add an ounce and a half of water and four or five drops of saturated hypo solution.

When the plate has been normally exposed and it is treated with this developer containing two drops of hypo, in a covered tray in the dark room, nothing will develop for 30 or 40 minutes. But in course of an hour and a half the picture will be fully developed. The details will show sharply through the film. The tray should be uncovered as little as possible. The plate is sensitive even to red light. Until the last stages of development are reached, the exposures for examination of the plate

should be as infrequent and as brief as possible.

A Cramer 'crown' plate placed in a printing frame under a thin or fast printing positive, will yield a negative picture when held for one second at a distance of three meters from a 16-candle incandescent lamp. The exposure may be gradually increased to an exposure of an hour at a distance of one meter from a 300-candle Packard incandescent lamp. How much longer the exposure may be is not yet known. All exposures up to three and a half minutes at a distance of one meter from the 300-candle lamp can be developed as fine negatives in the dark room. This last exposure may also be developed as a positive in light somewhat feebler than direct midwinter sunlight in St. Louis. With greater exposures, the illumination of the light room must be decreased, in order to obtain the best results. With the highest exposures producing developable results, the plate must be developed in the dark room.

The actinic values over this vast range are now being measured. The plates as developed are laid in proper position upon a series of large tables, about 40 feet in length. The coordinate values determining the position of the plate upon the tables are, exposure and illumination of the developing room.

The point which it is desired to urge in this communication is, that in the coming eclipses of this year and next, there is no need of losing any plates from over-exposure, even if they are exposed during the entire time of totality. It is hoped that this communication will cause those who are to take part in that work to lose no time in becoming familiar with the possibilities of development in a bath such as has been here described.

This communication has been prematurely published in order to direct the attention of those who are to take part in the observations of the next eclipse to a matter which may have great importance. It may be that some of the statements may require modification. For example, it is perhaps questionable whether exposure in a printing frame at a distance of a meter from a 300-candle lamp for three and a half minutes is an over-exposure of 2,000 times.* It is certainly a very great over-exposure.

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THE PROBABLE SUCCESSORS OF CERTAIN NORTH AMERICAN PRIMATES.

THE credit for the discovery of the affinities of the fossil Primates of the Eocene deposits of this country have been variously claimed by both Marsh and Cope. Leidy, however, appears to have clearly preceded both these investigators in this respect in his 'Vertebrate Fauna of the Territories,' published in 1873. In this work, in describing the lower jaw of *Northarctus tenebrosus*, a fossil monkey from the Bridger Eocene, he makes the following significant remarks: "In many respects the lower jaw of *Northarctus* resembles that of some of the existing American monkeys quite as much as it does that of any of the living pachyderms. *Northarctus* agrees with most

*Since writing the above it has been found that potassium bromide will do all that has been done with hypo as above described. The earlier failures in the use of bromide were due to insufficient quantity. In developing some good pictures near the zero condition a ten-per-cent. solution of bromide has formed a sixth of the bath. The bromide pictures are somewhat more brilliant, but do not seem so sharp and hard as some obtained by hypo. It may safely be stated that any camera exposure, from the shortest possible, to those lasting for hours, may be developed into a good picture. When the exposure is too great for development in the dark room as negatives, the plate may be as successfully treated in the light room and developed as a positive. A plate which will develop as a beautiful positive in the light of a 16-candle lamp, will develop a foggy mongrel picture, partly positive and partly negative in a perfectly dark room.

of the American monkeys in the union of the rami of the jaw at the symphysis, in the small size of the condyle, in the crowded condition of the teeth, and in the number of the incisors, canines and true molars which are also nearly alike in constitution. *Northarctus* possesses one more premolar and the others have a pair of fangs. The resemblance is so close that but little change would be necessary to evolve from the jaw and teeth of *Northarctus* that of a modern monkey. The same condition which would lead to the suppression of the first premolar, in continuance would reduce the fangs of the other premolars to a single one. This change with a concomitant shortening and increase in the depth of the jaw would give the characters of a living Cebus."

In studying the rich collections of this Primate material in the Yale Museum, I have been forcibly struck with the accuracy and wisdom of Leidy's comparison. Not only does it appear to me that there is a decided resemblance between these extinct North American forms and the living South American Cebidæ, but I am firmly of the opinion that the one was the direct descendant of the other. This proposition I find is sustained by a number of trenchant osteological facts which I hope to fully elucidate in my forthcoming publication on the subject.

While they may in general be said to be in a corresponding stage of evolution to that of the living Lemurs, they nevertheless belong to a separate and distinct phylum. This phylum detached itself from the main Primate stem far back in early Tertiary time. When the tropical forests receded to the southward of the land bridge which connected Asia with North America during practically the whole of the Tertiary, the interchange of species which were dependent upon this tropical vegetation was no longer possible, and at this point began the development of the two phyla, one of which terminated in the Old World monkeys and man and the other the flat-nosed monkeys of the New World.

In the earlier half of the Middle Eocene or Wasatch these monkeys were abundant in northern Wyoming. During the deposition of the Bridger beds or first stage of the Upper Eocene, we find them in southern Wyoming, where they may be said to have reached their culmination, so far, at least, as numbers and variety are concerned. We are at liberty to infer from much collateral evidence that this region was at that time intensely tropical and was highly suited to their manner of life, since some of the more common species are represented by remains of thousands of individuals in the collections. Towards the close of the Bridger, however, premonitions of the coming changes began to make themselves felt, probably first in the altered character of the vegetation. These were of such a nature as to cause another retreat to the southward, which must have been more rapid, since in the succeeding Unita or uppermost Eocene stage we find but a few stragglers of the hardier and more abundant species left behind. Such, however, soon disappear, and with this record, so far, at least, as our knowledge at present extends, their history on the North American continent closes. It is a highly significant fact that in the succeeding Oligocene and Miocene deposits the remains of monkeys are wholly absent, in the northern latitudes, at least, where they were formerly so abundant. The only conclusion we can draw from this is that the tropical vegetation had receded to the south, and taken with it all the inhabitants dependent upon it.

We next hear of these Primates in the Miocene beds of Patagonia, showing clearly that they had not only reached the South American continent at that time in their southward peregrinations, but that they had spread themselves quite to its extreme south-

ernmost limits. This fact argues strongly for a pre-Miocene land bridge between North and South America, just as the North American ancestry of the Edentata, as I have already pointed out, calls for a similar explanation. Had the conditions been favorable, and the southern barriers been sufficient to arrest further progress, we could believe that through stress of environment a much higher type of monkey, and possibly a man, might have been evolved in the Western Hemisphere in the manner so ingeniously suggested by Duncan. But as it is the Cebidæ represent the highest expression of Simian development which has ever been attained on this continent.

J. L. WORTMAN.

YALE UNIVERSITY MUSEUM,
January 23, 1901.

AMERICAN PSYCHOLOGICAL ASSOCIATION.

THE ninth annual meeting of the Association was held in Baltimore, December 27 and 28, 1900, in affiliation with the American Society of Naturalists. The President of the Association, Professor Joseph Jastrow, was in the chair, and on the afternoon of the 27th delivered the presidential address. At the business meeting held the same afternoon, Professor Josiah Royce was elected President of the Association for the ensuing year, and Professors J. Mark Baldwin and John Dewey were elected members of the Council for terms of three years. Several matters of interest were discussed at the business meeting. An invitation from President Harper to hold the next annual meeting at the University of Chicago was received and after full discussion it was voted unanimously that the invitation be accepted, power being given to the Council to arrange for the meeting.

A committee of five was appointed to consider the question of undertaking in part the publication of Dr. J. H. Leuba's proposed catalogue of psychological literature and to report at the next meeting of the Association.

A resolution was adopted that the Committees of Arrangements of Foreign Congresses of Psychology be requested to confer with the American Psychological Association with regard to the American representation at such congresses and the participation of American members in their proceedings.

Sessions for the reading of papers were held on the morning of the 27th and on both the morning and the afternoon of the 28th.

Professor Jastrow's presidential address was upon 'Currents and Undercurrents in Psychology.'* The speaker took up in turn various aspects of modern psychology. After discussing the significance of the evolutionary conception of the science, he spoke of the three-fold mode of approach, viz., the genetic, the normal and the abnormal, to many of its problems as being productive of interesting and valuable advance, and outlined the advantages and limitations of each aspect. The contemporary interest in certain functional complexes, notably reading and writing was noticed and the whole question of the practical bearing of psychology was discussed, the speaker assuming a conservative position in the matter.

At the first session on Thursday morning, Mr. Robert M. Yerkes, of Harvard, read a paper on 'Habit Formation and Memory in Invertebrates and Lower Vertebrates.' This was a preliminary report of some experimental studies in animal psychology now being conducted in the Harvard Laboratory. The chief purposes of the work are (1) to determine to what extent, with what rapidity, and precisely how, animals learn; (2) to test the permanency of any associations formed and (3) to make as many supplementary observations on the

* Published in full in the *Psychological Review* for January, 1901.

general habits and reactions of the animals used as possible. The labyrinth method, in various forms, has been used for all the work. Observations have thus far been made on the crayfish, green crab, fiddler crab, newt, frog and turtle. Crayfish in a simple labyrinth, involving choice of direction only once, improve rapidly from fifty per cent. correct in the first ten trials to ninety per cent. correct in the sixth ten. There is evidence of the habit (*i. e.*, memory) after two weeks' rest. Newts, judging from these studies, learn very slowly and there is successive variability among individuals. Frogs alone, of the animals named, have shown the formation of a habit as the result of a single experience. Turtles are very apt in the formation of labyrinth habits, and retain them for weeks. They give a curve of learning very similar to those of the cat and dog. In all the experiments record is kept of the time taken to escape from the labyrinth and of the course followed.

This paper was succeeded by one by Dr. Shepherd Ivory Franz, of the Harvard Medical School on 'Frontal Lobes and Association.' The experiments were undertaken to determine whether or not the frontal lobes in animals are concerned in the production of certain sensory-motor associations. Cats were given the opportunity of learning simple habits, after the learning of which the frontal area anterior to the crucial sulcus was excised. After the operation the habits previously learned were lost. A series of control experiments shows that this result cannot be accounted for on the supposition of surgical shock. The conclusion was drawn that the frontal lobes are *normally* concerned in the formation of these habits. The animals that had thus acquired and lost certain associations were found to have the ability for re-learning these habits and for acquiring new ones. This ability (re-learning) may be due to the use of other association areas (either the parietal or the occipito-temporal lobes), but the evidence is not yet complete.

Dr. R. S. Woodworth and Dr. E. L. Thorndike reported the results of the continuation of their experiments on 'The Influence of Special Training on General Ability.' The following conclusions seem to them justifiable:

The mind is, on its dynamic side a machine for making particular reactions to particular situations. It works in great detail, adapting itself to the special data of which it has had experience. Change in the time or precision or quality of any one of these particular reactions need not and often does not influence appreciably other reactions, similar enough to be called by the same name. Change in any one almost never brings about an equal change in any other reaction, no matter how similar, for the working of every mental function is conditioned by the nature of the data on which the function is employed. The amount of influence of changes in any one mental function upon others is much less than has been supposed. The cases of such influence and of its absence make it seem probable that change in one function affects others only where and in so far as identical elements are present in both. By identical elements are meant concrete elements, such as sensations, images, movements, etc., the actual content of which is identical.

Professor J. McK. Cattell reported on 'Psychological Tests of Abnormal and Exceptional Individuals.' Attention was called to the desirability of extending physical and mental tests to those suffering from disabilities and disease on the one hand, and to those showing exceptional aptitudes on the other. A description was given of cases of nervous disease tested by the speaker, and it was shown how these differed from normal individuals and how far the nature and

progress of the disease could be deduced from such tests. Turning to an exceptional case, similar tests made on the chess player, Mr. Pillsbury, were described. The speaker also noted the correlation of the tests made on the freshmen and seniors of Columbia College, mentioned tests made on the cleverest and dullest children in a primary and in a high school, and described a photographic method of measuring the features.

The last paper of the morning, by Professor E. F. Buchner, on 'Volition and Experiment,' was read by title.

On Friday morning Professor Edward A. Pace presented 'A Note on Binocular Rivalry.' The purpose of the experiments was to determine whether the fluctuation of retinal fields is influenced by such mental factors as expectation and recognition. It was found that when the fields (colored squares or figures) are presented in succession, the new field dominates in consciousness. The mere fact that one field is familiar and the other strange does not affect the result. Efforts of the will to retain a field when a new stimulus is applied to the other retina are not at first successful. By repetition, however, control is gradually acquired, so that, in proportion as the novelty of the intruding field wears off, inhibition becomes easier.

Professor Charles H. Judd followed with a paper, 'The Analysis of Writing Movements.' The method consists in attaching a tracer to the hand in such a way that it will not be affected by the fingers, but will record any movement of the hand as a whole. If one writes with such a tracer attached to the hand, the written letters will contain the finger components as well as hand and arm movements, while the tracer record will not contain the finger components. Apparatus and records were exhibited to illustrate the method. It is found that the hand and arm do not participate in the finer formative parts of the writing movement, but merely carry the fingers forward, thus contributing the grosser elements, especially those in a forward direction. Marked differences appear in the modes of coordination employed by different individuals.

Professor J. A. Bergström demonstrated an ergograph and reported studies made with the instrument.

Dr. Arthur MacDonald spoke on the susceptibility to disease and physical development in college women, the data on which his statistics were based having been furnished by the professor of physical culture and the resident physician in one of our woman's colleges.

Dr. E. W. Scripture described further experiments on rhythm made in the Yale Laboratory and Professor E. C. Sanford spoke briefly of some new apparatus.

In the Philosophical Section of the Association, which held meetings both in the morning and in the afternoon of Friday, Mr. Henry Rutgers Marshall spoke on 'Self-consciousness and its Physical Correlate.' If each special mental state in a given individual corresponds with a differentiation of process in that individual's nervous system, then 'self-consciousness' must have coincident with it some special form of neural activity. The neural process in man is the activity of an enormously complex neural system which itself is made up of minor neural systems: consciousness then, under this hypothesis, must be looked upon as a vast psychic system made up of minor psychic systems. System as a whole, any increment of activity in any minor system will stand in contrast with the mass of activity of the complex system as a whole. The most ordinary presentations to the Self correspond with such special increments of neural activity; hence we are led to ask whether the Self may not be that part of consciousness which corresponds with the mass of psychic activity in the complex neural system as a whole.

Mrs. Christine Ladd Franklin read a paper on the 'Reduction to Absurdity of the Ordinary Treatment of the Syllogism,' which will be published in SCIENCE. Other papers in the philosophical section were 'The Kantian Doctrine of Space,' by Professor George S. Fullerton; 'Nietzsche,' by Professor Grace Neal Dolson; 'Professor Ladd's Theory of Reality,' by Professor William Caldwell; 'The Doctrine of the Two-fold Truth,' by Professor F. C. French; 'A Study of Pluralism,' by Professor A. H. Lloyd; 'The Problem of an Emotional Logic,' by Professor W. M. Urban; 'Examination of Professor Sidgwick's Proof of Utilitarianism,' by Dr. Ernest Albee 'A Peripatetic Formula for the Moral Ideal,' by Professor W. R. Newbold; 'Active and Passive Reason in the Writings of Aristotle,' by Professor W. A. Hammond. The last named paper was read by title.

LIVINGSTON FARRAND.
COLUMBIA UNIVERSITY.

IOWA ACADEMY OF SCIENCES.

THE fifteenth annual meeting of the Academy met in Des Moines, Iowa, on December 26, 27, 28, 1900. A lengthy and an excellent program was carried out. The annual semi-popular lecture was given by Dr. Wm. Trelease, of the Missouri Botanical Garden, on the 'Harriman Alaska Expedition' on Thursday evening to a large and highly appreciative audience. The president, Professor W. H. Norton, delivered his presidential address on the 'Social Service of Science' on Wednesday evening. Professor Norton sketched briefly the service of science to society. This service is not appreciated as it should be, and yet nearly every modern convenience in the industrial world had its origin in the discovery of some scientific truth by some scientist, as in medicine, physics, electricity and mechanics.

Geological papers were presented by Dr. Charles R. Keyes on 'Depositional Equivalent of Hiatus at Base of our Coal Measures'; and the 'Arkansan Series,' a new terrane of the carboniferous in the western interior basin. The present Arkansas valley, however, has probably been formed entirely since Tertiary times, and by a system of drainage in no way dependent upon the carboniferous drainage. Where the great uplift of Missouri and Arkansas over the northern part—embraced by the so-called Ozark isle—and the southern part composing the Ouchita mountains were made up of resistant limestones, these yielded less quickly to erosion than the central soft shales; and the Arkansas river, which happened in old peneplain to traverse the central part of the uplifted area, was able to cut its way down as fast as the region rose, and was thus able to maintain its old course. In his paper on 'Names of Coals West of the Mississippi River' he indicated the stratigraphical units of the carboniferous in the western interior coal fields—the terranes of the Missourian, Des Moines and Arkansan being given. In a paper on the volcanic necks of Piatigorsk, Southern Russia, he briefly described the highest peak in Europe, Mt. Elburz, which is 18,526 feet above the level of the sea. Mr. T. E. Savage briefly gave an account of the 'pre-Kansan Drift Exposure in Tama County, Iowa.' His conclusions were based on the buried soil, in which organic matter was found, leaching, and an oxidized zone. Professor Shimek made a comparison of the loess and modern 'Molluscan Fauna of Iowa City and Vicinity.' A large number of the species enumerated are aquatic.

Of chemical papers, Professor Nicholas Knight, on 'Some Recent Analyses of Iowa Building Stones,' stated that the chemical composition varied from nearly typical dolomite to admixtures in different proportions of calcium carbonate and dolomite. In his paper on 'Potable Waters' chemical an-

alyses were recorded for deep wells in Mount Vernon as well as analyses from the Cedar river. The wells were all more than 100 feet deep, the albuminoid ammonia running as high as .088, free ammonia .084, nitrates 1.38; the latter amount of nitrates was found in an artesian well which supplies the city of Mount Vernon and is 330 feet deep.

Dr. J. B. Weems and Mr. J. C. Brown presented a paper on 'The Influence of Chlorin as Chlorid in the Determination of Oxygen consumed in Water Analysis.' In this paper attention was called to the large amount of chlorin as chlorids in the deep well waters of the State. Naturally in the determination of the oxygen consumed in these waters there is a question of interest as to the effect of the chlorids in the potassium permanganate solution. The effect of chlorin in the form of sodium chlorid, in amounts from 5 parts to 1,800 parts per million of water, was investigated, using the Kubel, Schultz, Tidy or English, and the Association methods.

Another paper by the same authors considered the chemical investigation of a well which was the probable cause of an epidemic of typhoid fever.

Dr. J. B. Weems and Mr. H. N. Grettenberg presented a paper on 'A Study of Some Cotton-seed Oils' in which the analytical results of nine samples of cotton-seed oils were given and the results compared with the usual standards for oils of this class. Professor Alfred N. Cook discussed the 'Diphenyl Ether Derivatives,' being a summary of our present knowledge of the subject, as well as some original work on the diphenyl ether derivatives.

Zoological papers were presented as follows: Professor H. M. Kelly, 'Notes on the Time of Sexual Maturity in Certain Unios.' He believes that the period of sexual maturity does not always recur every year. Professor H. W. Norris in a paper on a 'Combination of Chromic Acid, Acetic Acid and Formalin as a Fixative for Animal Tissue,' gave excellent results for fixing mammalian tissues—in some tissues better results than he has been able to obtain with any other fixing fluid; it is especially good for glands and mucous epithelium. It is not satisfactory for nervous tissue. In his paper on the 'Morphology and Function of the Amphibian Ear,' Professor Norris stated that in this transition class of vertebrates, the Amphibia, the organ of hearing originated from an organ of equilibration which latter function is always retained. Professor H. E. Summers presented a paper on the 'Generic Synopsis of the Nearctic Scutelleridæ and Cydnidæ.' Professor E. D. Ball presented a monograph on 'A Review of the Tettigonidæ of North America North of Mexico.' Of the 500 or more described species the great majority are found in the region between Mexico and Brazil. Seven genera are represented in America north of Mexico.

Bacteriological papers were presented as follows: C. H. Eckles, 'A Comparison of Media for the Quantitative Estimation of Bacteria.' It was noted that ordinary peptone agar is not suitable for the development of a large number of bacteria, especially the lactic acid species. Both lactose gelatine and lactose agar gave much better results than either peptone agar or peptone gelatine. L. Russell Walker, in a paper on 'Sewage Disposal,' with special reference to the number of bacteria found in the sewage and effluent of the Iowa State College sewage plant from September 1, 1899, to September 1, 1900, stated that it was found that the percentage of gas-producing bacteria was greatest in the manhole and least in the effluent, while the number in the tank lies between. L. H. Pammel, in 'Notes on the Bacteriological Analysis of Water,' gave the results of an examination of the water supply of the Iowa State Col-

lege as well as other wells in the vicinity of Ames, and especially the wells that were supposed to have conveyed typhoid fever to the students of the college. There was shown to be a very wide variation, but in the case of the epidemic at Ames the milk was shown to have been the agent that conveyed the disease.

Botanical papers were presented by H. A. Mueller on the 'Shrubs and Trees of Madison County'; T. J. Fitzpatrick, on the '*Cupuliferæ* and *Juglandaceæ* of Iowa,' and one by F. M. Witter, on 'Some Observations on the Flora of Southern Alabama and Louisiana.' James E. Gow presented a 'Preliminary List of the Flowering Plants of Adair County.' Mr. F. W. Faurot described the early development of *Astragalus caryocarpus*. In fixing, best results were obtained by the use of Flemming's, although platinic chloride also gave good results. Professor Shimek, in his paper, 'Addenda of the Flora of Lyons County,' reported *Juglans nigra* and several herbaceous plants for that county. L. H. Pammel presented a paper on the 'Thistles of Iowa.'

An expedient for maintaining a constant temperature through the process of salt-glazing clay was presented by Ira J. Williams.

A committee on pure food legislation, consisting of C. O. Bates, J. B. Weems, Nicholas Knight, M. Ricker and W. S. Hendrixson was appointed, and also one on forestry, consisting of L. H. Pammel, T. H. Macbride and H. A. Mueller.

L. H. Pammel.

THE NEBRASKA ORNITHOLOGISTS' UNION.

The annual meeting of the Nebraska Ornithologists' Union was held in the lecture room of the Omaha City library, January 12, 1901. President J. S. Trostler called the meeting to order for a business session which occupied the morning. During the noon hour the visiting members were the guests of the resident members, who had a luncheon prepared in the dining-room of the Omaha Commercial Club. The afternoon was devoted to the reading and discussion of papers. Measures were adopted and resolutions drafted in the interest of greater protection for all birds of the State. It was the expression of the body that the growing revulsion of feeling against bird slaughter would soon lead to such improved sentiment that the hunter's path through the woods could not be tracked by the blood of birds shot indiscriminately.

In the absence of Mr. J. H. Ager, State Warden of the League of American Sportsmen, Professor Lawrence Bruner reported upon an important measure for the protection of fish, game, and birds, to be presented for legislative action at the present session. The recent balloting for officers resulted as follows: *President*, Erwin Hinckley Barbour, Lincoln; *Vice-President*, Miss Elizabeth Van Sant, Omaha; *Corresponding Secretary*, J. C. Crawford, Jr., West Point; *Recording Secretary*, Robert H. Wolcott, Lincoln; *Treasurer*, Charles Fordyce, University Place; *Executive Committee*, Lawrence Bruner, Lincoln; F. H. Shoemaker and J. S. Trostler, Omaha. The Secretary announced the present membership as ninety-five.

PROGRAM.

President's Address, 'History of Ornithology in Nebraska and of State Ornithological Societies in General,' by J. S. Trostler, Omaha.

'The Relation of Birds to Agriculture,' by L. Bruner, Lincoln.

'Injurious Traits of the Blue Jay,' by E. D. Howe, Table Rock.

*'Ornithology in the Schools,' by Wilson Tout, Utica.

'The Value of Birds as Objects of Study in the Grades,' by Chas. Fordyce, University Place.

'A Late Nest of the Ruby-throated Hummingbird,' by Frank H. Shoemaker, Omaha.

'Young Rose-breasted Grosbeaks, by Elizabeth Van Sant, Omaha.

'The Breeding of the Prothonotary Warbler in the

*Read by title.

Missouri River Bottom,' by M. A. Carriker, Nebraska City.

'Observations on Traill's Flycatcher,' by M. A. Carriker, Nebraska City.

*'On the Distribution and Breeding Habits of Bell's Vireo,' by Merritt Cary, Neligh.

'Some Notes on a Chimney Swift Tree,' by J. S. Trostler, Omaha.

'Birds that Nest in the State,' by L. Bruner, Lincoln.

'A Peculiar Disease of Birds' Feet Observed in Western Nebraska,' by E. H. Barbour, Lincoln.

*'Intestinal Parasites of Nebraska Birds,' by H. B. Ward, Lincoln.

*'Changes in the Bird Fauna of the Prairies in the Last Thirty Years,' by L. Sessions, Norfolk.

'Additional Observations on the Birds of Northwest Nebraska,' by J. M. Bates, Long Pine.

'Results of a Collecting Trip to Sioux County,' by J. C. Crawford, Jr., West Point.

'Notes on Cherry County Birds,' by J. S. Hunter, Lincoln.

'Notes on Birds from Western Nebraska,' by A. R. Graves, Kearney.

'Notes on Some of the Rarer Birds of Gage County,' by M. H. Swenk, Beatrice.

'Additional Observations on the Keeping of Records,' by R. H. Wolcott, Lincoln.

'Sketch of M. L. Eaton,' by R. H. Wolcott, Lincoln.

*'Behavior of Birds when driven from their Nests,' by W. Edgar Taylor.

'Miscellaneous Notes.'

After President Trostler had inducted the newly elected President into office, the meeting was adjourned.

EDWIN H. BARBOUR,
UNIVERSITY OF NEBRASKA. *Secretary.*

THE KANSAS ACADEMY OF SCIENCE.

THE thirty-third annual meeting of this Academy was held at Topeka on Dec. 28–29. The following papers were read:

E. B. Knerr reported upon an artesian well at Muskotah, from which a very potable water flows at the rate of fifty-five gallons per minute. This water has a temperature of 56° F. J. T. Willard gave an account of some experiments on the relative digestibility of raw and cooked proteids. The experiments were made upon peas, beans, oat-meal, and flour, with a weak pepsin solution. The general results showed that the proteids in all these articles were much more digestible raw than cooked. While cooking diminishes the digestibility of the proteids, it of course increases that of the carbohydrates. The same author reported some results obtained at the Experiment Station in reference to the effect on the soil of continuous cropping of wheat. The figures given showed that the soil was in a marked degree deprived of soluble phosphoric acid by this continuous cropping. Parallel analyses were made of the soil of a field where wheat had been grown continuously for many years, and of an adjoining field where a variety of crops had been grown, and in the latter this loss of phosphoric acid did not occur. Professor Willard also discussed the effect of oxygen upon organic life. The tests made showed that, as far as the lower animals were concerned, it made very little difference whether they breathed oxygen or ordinary air.

A. E. Langworthy gave a complete report of a diamond drill boring recently made at Atchison. The drill disclosed no less then sixteen seams of coal, having together a thickness of fourteen feet and six inches. The most interesting of these seams are a 36-inch seam at a depth of 1,123 feet, a 28-inch seam at 1,187 feet, and a 15-inch seam at 1,197 feet. The 36-inch vein is a specially good quality of coal. An analysis of the Mississippian limestone, from this boring, is reported by Fred. B. Porter. W. C. Bauer reported on the work of the United States Coast and Geodetic Survey as carried on at Baldwin.

C. N. Gould read a paper on the salt plains of Oklahoma. The largest of these covers an area of nearly 50 square miles. Salt springs are found in various localities, so that a practically inexhaustible supply of salt can be obtained. The same author reported on the 'Southern Extension of the

* Read by title.

Marion and Wellington Formations' and on 'The Dakota Cretaceous of Kansas and Nebraska.' A. S. Hitchcock gave a list of the plants collected in Lee County and other localities in Florida, a region of great interest to the botanist on account of the diversity of the flora.

Warren Knaus, in reporting on the additions to Kansas coleoptera, stated that the number of known species is now 2,500. W. K. Palmer gave an illustrated paper on 'The Value of Geographical Methods in the Teaching of Thermodynamics'; also on 'The use of Ball-bearings for General Machinery and on Principles of Chimney Design.' E. C. Franklin discussed the experiments that he has been conducting during the past year, upon the use of 'Liquid Ammonia as a Solvent.' Many of these experiments, which have already been published, throw a great deal of light upon the new theories of solution. An interesting paper on the Americus limestone, was presented by Alva J. Smith. The area covered by this excellent building stone was discussed, and an analysis given. L. E. Sayre spoke on the 'Medicinal Plants of Kansas.' He mentioned the medicinally valuable plants of the Asclepiadaciae and gave the geographical distribution of the medicinal plants of this genus and the commercial value of the products.

J. R. Mead gave an interesting paper on the peculiar formation known as the 'Flint Hills'; and also one upon the 'Archeology of Catalina Island,' illustrating the latter paper with fragments of ancient vessels. S. W. Williston described a new cretaceous turtle which he has recently studied. A paper from Edward Bartow gave an account of the work being carried on at the Laboratory of the State University on 'Sanitary Water Analysis of the Kaw River' and other streams and miscellaneous sources of supply in the State. Grace B. Meeker read a paper that attracted much interest, upon the wild flowers of the locality that are adapted to cultivation. This brought out a discussion in which much valuable information was elicited. J. W. Beede reported on 'Some Contributions toward a Monograph of the Permian of the central United States' and also, in connection with C. N. Gould on 'The Kansas-OklahomaTriassic and its Invertebrate Fauna.' The same author discussed the 'Atchison Shales.' E. H. S. Bailey gave the analysis of a Mangano-ferrous mineral water, that contains more manganese than any water that has been previously noticed. L. N. Morscher read a paper on 'The Rôle of Isostacy.'

H. P. Cady has devised a new method for the detection of arsenic, antimony and tin. The arsenic is precipitated in a concentrated hydrochloric acid solution by a current of hydrogen sulfid gas, and to the solution hydrogen sulfid water is carefully added, when the antimony will be precipitated, and upon the further addition of the same reagent tin will be precipitated, so that at the end of the operation there will appear three distinct layers of sulfids of the metals in the test tube. Geo. H. Curtis read a paper on 'The Food of Fishes in central Kansas.' J. C. Cooper reported on some interesting specimens of nodular pyrites.

Several valuable lists were placed on record, as that of 'The Spring Flora of Cowley Co.,' by Mark White; a catalogue of the 'Goss Ornithological Collection' by B. B. Smyth; a list of 'Birds observed in Dickinson County' by D. E. Lanz; a catalogue of the 'Crayfishes of Kansas' by J. A. Harris.

The evening of Friday was occupied by the address of the retiring president, A. S Hitchcock, on 'Ecology, or the Effect of Environment upon Plants,' an illustrated lecture on 'The Milky Way,' by E. Miller, and another paper, also illustrated, on 'Mines and Minerals of Kansas,' by G. P. Grimsley.

E. H. S. Bailey.

*THE STANLEY-McCORMICK HOPI EXPEDITIONS.**

IN 1897 the Hopi collections of the Field Columbian Museum were comprised within three cases and consisted chiefly of a gift from Mr. Ayer, supplemented by a small collection purchased from Mr. Keam, a Hopi trader. During this year I made an extended collecting trip through a number of the Western States, visiting on my return the Hopi pueblos, where I remained five days, which were spent in collecting ethnological material. From several sources, previous to my visit, I had heard of a collection which the missionary Mr. H. R. Voth had been forming during a number of years, to assist him in his studies. While examining this collection I was at once impressed not only with its great beauty and richness, but with the detailed knowledge which Mr. Voth possessed concerning every object in his collection. At that time there was no willingness on his part to sell any or even a portion of the collection, and in fact its sale was not even seriously considered.

In December, 1897, I revisited Oraibi, the largest of the Hopi villages, in company with Mr. Melville, an attaché of the department as modeler and sculptor. The object of this visit was to secure life casts of several Hopi for the production of a large group which would illustrate certain phases of their house life. Mr. Voth had in the meantime enlarged his collection, and I was more than ever brought to a realization of the value of its accession for our Museum. I returned to Chicago with the idea that we should secure the Voth collection, as well as the services of Mr. Voth that he might arrange the collection and construct certain altars, etc., illustrative of the religious life of the Hopi.

Shortly after my return I consulted with Mr. Ayer in regard to the matter, and it was through his interest in the Museum that the subject was brought to the attention of Mr. Stanley McCormick, who, in January, 1899, notified me that he would contribute a certain sum toward the work, as had been outlined by me. Within a few days after this announcement of McCormick's intention, Mr. Voth arrived at the museum and began work, continuing with the museum uninterruptedly until May 1, 1900, when he left for Oraibi again to assume his duties as missionary. During Mr. Voth's connection with the museum his entire collection was installed, nine altars, involving an immense amount of detailed labor, were constructed, and over 1,700 labels were written. While Mr. Voth had never had previous experience in museum work, his natural ability was so great, his knowledge of the subject so profound and his earnestness so intense, that a great deal of work was accomplished in that time, and it was with no little degree of regret that I saw Mr. Voth leave for his field of work as missionary.

While the collection acquired from Mr. Voth contained a large amount of ancient pottery, yet the major part of the collection was purely ethnological, and it soon became evident that if we were to derive full benefit from the opportunities which presented themselves in Arizona for a complete exhibit of a single tribe, we must at once set about to secure a proper representation of ancient Hopi life, as remained concealed within the ancient house ruins and burial places. Much archeological investigation of this sort had already been carried on by other investigators, especially by Dr. Fewkes of Washington, who for many years had devoted much time to this work and always with consummate success. I decided, therefore, that while attempting to make our collection representative of all parts of the territory covered by the ancient Hopi, we should pay especial attention

* Read before the Chicago Society of the Archeological Institute of America, December 18, 1900.

to the ruins which heretofore had been lightly passed over; especially was it my desire that we might discover new ruins where yet remained interesting material. In accordance with this idea Mr. Burt, an assistant in the department, left Chicago early in December of 1899, and began a series of explorations in the well-known ruins of Homolobi near Winslow, on the Little Colorado River. He pushed on to the west, following the course of the river, and investigating one ruin after another for a distance of seventy-five miles. The result of this expedition was that our knowledge of the Hopi was considerably extended in a hitherto unexplored region, which was occupied by several clans, where the manufacture of the so-called yellow ware of the Hopi had not been practised. In none of the ruins explored by Mr. Burt beyond the point known as Cable Crossing, did he encounter any of this so-called yellow ware, but large quantities of other ware, the black and white predominating. About the same time that Mr. Burt left for the Little Colorado, Mr. Voth and I left Chicago for Oraibi, where we spent a little less than a month. The object of this—the second McCormick expedition—was not so much to secure material as to get additional information regarding certain altars. In this we were entirely successful, and while there had the good fortune to witness the nine day Soyal or Winter Solstice ceremony. Full notes were taken on this interesting ceremony and it will form the subject of a Museum publication shortly forthcoming. A number of interesting objects were also added to the collection on this expedition, of special interest being a number of masks and certain *tihus* or dolls which had never before been reproduced for the purpose of trade. Early in the present year, Mr. McCormick's attention was called to the fact that additional funds would be needed if the work was to be carried on, and he very generously announced his intention of making provision for the continuation of the work and above all for an extension of archeological investigations among the ruins.

Early in May of this year I again sent Mr. Burt, on the third McCormick expedition, to the Lower Colorado, in order that the work which had been abandoned on the previous year, on account of the setting in of winter, might be continued. Mr. Burt continued his explorations on into the country of the lower Little Colorado river, reaching on this occasion Black Falls. As a result of this expedition many additional specimens, including a large number of turquois beads, implements, utensils and ornaments of stone, bone and shell were secured, as well as a number of skeletons which will prove of the greatest value when the time comes to attempt to reconstruct the past life of the Hopi, so far as relates to their physical characteristics. It is only just to Mr. McCormick to say that he very generously made special provision for this second expedition of Mr. Burt's. The fourth and last McCormick expedition has just terminated after a period of eight months; this was in charge of Mr. C. L. Owen, also an assistant in the department, who left Chicago early in May. Mr. Owen confined his attention to the ruins located within the limits of the so-called Province of Tusayan, and the first five months of his time were spent in excavating at the great ruins of Sikyatki, Awatowi, old Mishonovi and old Cunopavi. All these ruins were well-known to scientists, and from many of them collections of considerable importance had been made, but so valuable are they for the purpose of reconstruction of the past history of the Hopi that it was considered especially desirable to form as large a collection as possible from each one. In this Mr. Owen was entirely successful, finding a hitherto unknown burying ground at

Sikyatki which yielded important results, and from Mishonovi—one of the most important of the Hopi ruins—securing over 600 pieces of decorated pottery alone, while from other regions he secured representative collections. Having exhausted the region in the immediate vicinity of the present Hopi villages he turned his attention to ruins of the North, many of which had never been previously visited by any scientist. While in this region he discovered ruins which we have reason to believe had never been seen by any white man. As a result of this expedition the Museum acquired nearly three thousand invaluable specimens, comprising every object which we might reasonably expect to find in graves or house ruins, and including a large number of rare forms of bahos or prayer offerings. Many unusual forms of stone implements, idols, and mask forms were found, while especially noteworthy are four painted stone slabs which probably once served in some Hopi altar and of which specimens have rarely ever before been found. Concerning the exact value of the contributions which may be made to science as a result of this last Hopi expedition it is of course too early yet to speak, but that our knowledge of the Hopi and of their migrations has been extended in many ways there is no question.

Finally there may be considered the contents of the two halls in the Field Columbian Museum devoted to the Hopi, for here, it may be properly assumed, are the visible, tangible results of these McCormick expeditions. Of the thirty-four cases which contain these collections, eleven are devoted to the ordinary every-day life of the Hopi. Here we may trace in detail, by means of thoroughly labeled specimens, models and three life-like groups, the domestic life of the Hopi through every phase of industry—such as pottery-making, basketry, spinning and weaving, costumes, stone and bone utensils of various sort, etc. In the same room with these domestic collections are to be found several cases containing such of the material from ancient ruins as has been put on exhibition. These collections, however, it is to be expected, will be removed from this hall and shown in an adjoining hall along with collections which have been derived from the last two expeditions and which may be derived from further expeditions.

Much might be said of the interest attaching to the numerous specimens which these expeditions have yielded, but attention can only be directed to a single group of objects, namely, the yellow ware food bowls. Each one of these bowls is beautifully made (in fact no finer pottery has been found in America) and they are generally decorated on the interior with certain mythological figures or symbols. Among these bowls are very few duplicates, each one having its own story, having served during the life of its owner its own peculiar mission.

The second Hopi room is devoted to ceremonies and to the religious life in general of the Hopi. In this hall no distinct phase of the ceremonial or religious life has been omitted, and simply to show the fullness and richness of the collection, mention may be made of two or three categories of objects. While the Hopi are not greatly addicted to smoking, yet the use of tobacco forms a very important part in all of their ceremonies, and, for the production of smoke which shall symbolize clouds, special forms of pipes are used, known as cloud blowers. In other ways also during ceremonies pipes of special construction or design are used. The collection numbers over sixty interesting and carefully labeled specimens of pipes, many of which are extremely rare forms. During the ceremonies many forms of bahos or prayer messengers are used, and as these bahos are not made

for the purpose of trade, but as a rule are immediately after consecration deposited in shrines or springs, they are rather difficult to obtain, yet the collection numbers over 150 specimens of these interesting objects, representing nearly every form of baho known to the Hopi.

The figurines produced by the Hopi men and given by the mothers to the children during the *Niman*, or Farwell ceremony, and known as *tihus*, are objects found in all Hopi collections, but as a matter of fact these *tihus*, which represent certain mythological personages called *Katcinas*, are only reproduced for a limited number of characters. Owing to the unusual zeal shown by Mr. Voth toward the collection of this class of objects, the collection, with the recent addition of specimens brought home by Mr. Owen, numbers not less than 275, comprising over two hundred distinct varieties, a great many of which were reproduced for Mr. Voth only after earnest endeavor on his part. Inasmuch as these *tihus* represent *Katcinas* and as these *Katcinas* play a very important part in the religious life of the Hopi the importance of a collection of this magnitude, carefully arranged and labelled, can not be overestimated. Even more difficult than these *tihus* to obtain are the masks which are worn by the Hopi as they personate deities in the *Katcina* dances. The Hopi regard these masks with considerable reverence and do not willingly part with them, yet the collection numbers one hundred and thirty specimens, many of them being made of elk or buffalo hide.

But more important than these collections, however valuable and interesting, are the altars and sand mosaics, which are faithful, painstaking reproductions of altars which are erected year after year in the underground *kivas* of the Hopi. There may come a time when the actual altars themselves may be obtained, but up to the present, so highly are they revered by the Hopi that no sum of money, however great, would induce them to part with a single slab from a single altar. The altars reproduced by Mr. Voth number nine, namely—the Antelope, Snake, Flute, Powamu, Powalawu, Katcina, Soyal, Marau and Oöquol. These altars are such as are erected by the Hopi during the great nine-day ceremonies, and while they do not exhaust the subject for even a single Hopi village, they are by far the most important altars and comprise within their number all those which contain images or fetishes. In most of the ceremonies represented by these altars, during the years when initiations are performed, sand mosaics are added to the altar, and comprised within the altars which have been reproduced are all those which contain this additional feature of interest. Mr. Voth also reproduced the great Ballülukon screen which is erected in the *kiva* during one of the ceremonies, and which is manipulated by means of concealed wires, to the intense delight of priests and the great mystification of the novitiates present.

The work which has been accomplished by the McCormick expeditions up to the present time has, I believe, been thorough and in every sense worthy the generosity of the patron. It must be admitted, however, that much yet remains to be done of equal value and importance among the Hopi of to-day and among the ruins of the past.

George A. Dorsey.
Field Columbian Museum.

SCIENTIFIC BOOKS.

An Atlas of Representative Stellar Spectra from λ 4870 to λ 3300, together with a Discussion of the Evolutional Order of the Stars, and the Interpretation of their Spectra, preceded by a Short History of the Observatory and its Work. By Sir William Huggins and Lady Huggins. London, William Wesley & Son.

This sumptuous volume of 165 folio pages worthily represents a part of the work which has been quietly in progress during the past forty years at the little private observatory at Upper Tulse Hill, London, one of the most important outposts at the frontier of astrophysical science. The additional title, 'Publications of Sir William Huggins's Observatory, Vol. I.,' leads us to hope that this introductory volume may soon be followed by others which shall give in similar manner the results which have been gained from the minute study of the large store of photographs which have been secured by the talented authors during many years of patient experiment and observation.

The first chapter gives a brief 'history of the observatory, and of the work done therein.' At the present day, when a photograph of the spectrum of a bright star may be obtained with an exposure of but a few minutes,—or even seconds, we are likely to fail to appreciate the difficulties and discouragements of the pioneers in these delicate researches, and we may forget how our present large and rigid instruments have slowly evolved from the first combinations of spectroscopes and telescopes. It was soon after the establishment of the private observatory that Mr. Huggins learned of the discovery by Kirchhoff and Bunsen of the true nature of the dark lines of the solar spectrum, which had been unexplained for more than half a century after their discovery. It at once suggested a wide field of research, and, as the author states, 'then it was that an astronomical observatory began, for the first time, to take on the appearance of a physical laboratory.' With the collaboration of Professor W. A. Miller, the spectra of forty stars and of Jupiter and Mars had been observed at the end of 1862. The news of the similar work of Mr. W. M. Rutherfurd in America arrived on the day the preliminary paper was to be read at the Royal Society.

The photography of stellar spectra was attempted in 1863, the wet process, of course, being employed, but the dark lines were not shown on the plates until the attempt was resumed in 1875. Meanwhile the chemical origin of a number of the lines in stellar spectra was established, and in 1864 Mr. Huggins made his famous observation on the spectrum of a nebula, demonstrating its gaseous constitution. In 1866 a temporary star, *Nova Coronæ*, was first observed spectroscopically; and in the same year was begun the construction of a spectroscope for determining the velocity of stars in the line of sight, the results of the use of which were published in the *Philosophical Transactions* in 1868. Later, attention was given to the spectra of comets, and to attempts at the spectroscopic observation of the red prominences previously only seen during solar eclipses. Although the principle underlying their visibility in the spectroscope was clearly stated by Mr. Huggins early in 1868, he did not actually succeed in detecting them until after their discovery by Lockyer and Janssen later in that year.

Larger instruments and the dry-plate process permitted much progress in the work on stellar spectra after 1875, which is recorded in numerous papers read before the Royal Society in the subsequent years. The titles of eighty-two papers on work done at the observatory are given in the second chapter of the work. Chapters III. to V. describe the instruments and methods of obtaining the spectra, and of broadening them, the descriptions being largely quoted from the journals in which they were originally printed.

Chapter VI. occupies one quarter of the volume, and is entitled 'Discussion of the Evolutional Order of the Stars and the Interpretation of their Spectra,' with sections on (1) the types of stellar spectra, (2) original differences of stellar constitution, (3) classification of stellar spectra, and (4) physical and chemical interpretation of stellar spectra by means of terrestrial spectra observed in the laboratory.

In addition to its absorbing interest to students of astronomy, this chapter can hardly fail to be attractive to the general reader of scientific topics. The author quotes freely from his published addresses bearing upon this subject, and brings into discussion the work of other astronomers and physicists, although drawing his observational data chiefly from his own work. In the matter of classification of stellar spectra the author follows in the main the scheme suggested by H. C. Vogel in 1874.

The white stars are considered to be in a more diffuse state than our Sun, and hence in an earlier stage of development. The subdivision represented by Bellatrix, which has a characteristic spectrum of the 'Orion type,' is placed first in the order of stellar evolution. Considerable space is devoted to the question of which class of spectrum corresponds to the highest temperature of the radiating photosphere, and numerous lines of evidence are adduced to support the view that this is found in case of the stars with spectra of the solar type. The argument based upon the relative extension of the continuous spectrum into the ultraviolet region, the extension of the solar type being regarded by the authors as the greatest, is not wholly convincing, as the difficulty of securing identical conditions of exposure, atmospheric absorption, etc., in the case of different stars of different types, is very great. But emphasis is well placed upon the importance of taking into account more fully than has hitherto been done the large diminution in the star's effective radiation from the integrated effect of the selective absorption of its atmosphere; that is, from the absorption represented by the very numerous dark lines in spectra of the solar type.

Attention is drawn to the important effect of the convection currents in stellar atmospheres, and their increasing activity in the region where the dark lines originate, as the stars advance in age. This increase is assigned as a possible cause of the diminished prominence of the hydrogen lines in the spectra of the second and later types.

The reasons for the presence of certain particular lines of certain particular elements in the spectra of stars at different stages are considered by the authors to lie in the conditions of the absorbing region, as to density and composition, particularly the mixing of various vapors. The absence of the metallic lines from the spectra of the first type is attributed in part to the slight convectional effects in the very diffuse atmospheres of these stars, so that as a result of diffusion hydrogen and the lighter elements preponderate in the region where absorption occurs; and in part to a slow temperature gradient, so that the vapors just above the photosphere might differ in temperature too little from the photosphere for their lines to be seen as dark on the continuous spectrum.

The effect of density of the vapor is quite fully considered, particularly in connection with the laboratory experiments of the authors on the behavior of the calcium lines.

The twelve half-tone plates which illustrate the volume are admirably done, and represent extended and skilful work by the authors in their arrangement. Plate II. contains reproductions of numerous 'historical spectra,' as they are well named, obtained by the authors between 1876 and 1895. These are fully described in Chapter VII. The remaining plates receive a 'preliminary discussion' in Chapter VIII.

The treatment of the subject as a whole is qualitative rather than quantitative, and is not mathematical, so that the general reader can follow the clear and philosophical reasoning of the authors without the necessity of a previous familiarity with technical symbols.

Artistic head pieces and initials appropriate to the subject, the hand work of Lady Huggins, complete the adornment of the volume. The work has received the Actonian prize of the Royal Society, and the election of Sir William Huggins to the presidency of the Royal Society at this time will be recognized as highly appropriate.

Edwin B. Frost.

Annual Report of the Chief of the Bureau of Steam Engineering of the U. S. Navy Department, 1900. Washington, Government Printing Office. 1900. 8vo. Pp. 128, pl. 17, folded.

This report, apart from its importance as detailing the work in applied science of one of the most important bureaus of the U. S. Government, has a peculiar interest at the moment to all who have become aware of the tendency illustrated, for example, in the operation of the National Observatory and of the Coast Survey, toward amateurism in all branches of the Government service. The Engineer-in-Chief of the Navy, Admiral Melville, is one of the most competent expert professionals in the Navy, or outside it, in his department, and his report, while giving an admirably condensed account

of the operations of his bureau during the official year 1899–1900, exhibits a state of affairs, in a vitally important department of public service, which must intensely interest, and at the same time alarm, every patriotic citizen.

The report includes a statement of the appropriations, and, in detail, the expenditures, of the branch of that departmental organization which is entrusted with the employment of two and a half to three millions of dollars annually in the design, construction, repair and maintenance of the naval machinery of our whole fleet. It gives an outline of the work in hand and an account of that performed during the past fiscal year, details of the inspection of contract work, and of the conduct and results of trial trips of new vessels in the Navy and of old craft repaired. It considers the character, numbers and efficiency of the personnel of the engineer department of the Bureau and of the fleet, the effect of recent and of proposed changes, and especially of such as affect the organization of the Navy Department and the crews of our vessels.

This Bureau has expended in the year reported upon over $2,500,000, of which about one-half represents costs of labor and one-half expenditures for materials. In addition to extensive work in the designing of new machinery, the Bureau is compelled to examine and report upon several thousands of detail drawings submitted by contractors. Some conception of the extent and importance of this work may be obtained when it is known that, for a single ship, the *Kearsarge*, about 600 drawings were made of approved constructions and an uncounted number of proposed variations or expanded details. Even small craft, like the torpedo-boats, require almost as much work, though on a smaller scale, as they have nearly as many working parts as the largest vessels. There are seventy vessels under construction, or about to be contracted for. For all this work, and for the operations of the fleet, large numbers of engineer and constructing experts are needed; but, meanwhile, the number available, which has for years past been entirely inadequate, is constantly being reduced by retirement, death and resignation; no proper arrangements having been made for its maintenance.

Where, for example, about twenty-five inspectors are needed, fifteen are to-day compelled to do the work as best they can, with evident risk to the efficiency of the service; where about thirty officers are needed at the Navy yards and stations, fourteen carry the burden, with similar risks to the service. 'The present force of engineer-officers is everywhere overtaxed,' but there is no way provided by which to relieve these officers or to add to their numbers, in a proper manner, the needed additional expert and experienced officers, possessed, as they should be, of an ample scientific and technical training and varied earlier experience. The ideal preparation is obviously some such preliminary general and special scientific education as is now, as a matter of course, presupposed in civil life, a professional apprenticeship and later experience in actual work of design and construction, and opportunities to exhibit that capacity for scientific work and for the management of productive organizations which, only, insures professional success, alike, in public and in private business. In fact, the tendency seems to be, in this as in so many other branches of the public service, to permit the most important affairs to drift into the hands of incompetents or, at best, of amateurs, personally clever, often, but entirely unequal to the conduct of affairs demanding special education, special experience, and native talent properly cultivated and developed by the common and essential process of evolution under the unsparing system of selection which obtains in a career of any sort in everyday life.

The Chief of Bureau protests, for example, against a proposed consolidation of the long-established bureaus of the Navy Department, in which a branch of the work of the service, as mechanical engineering, naval construction or navigation, is entrusted to a body of experts in that branch, presided over by a selected expert-chief detailed from the list of most experienced, talented and distinguished officers in the service. This must result, as is pointed out very clearly and convincingly, in either the introduction, as a general supervising officer,

of one who is expert only in his own special field or of one who has no expert knowledge of any branch. In the first case, the outcome would be what is seen in so many other governmental departments already: the subordination of able and competent men to an official without the ability to direct and who is made an official superior over men, each in his own department, without superior. In the second alternative case, the Secretary of the Navy, usually a man without any expert knowledge of the technical work of the service, will have, interposed between himself and the men who are competent to advise him, each in his own province, an officer equally incompetent with the Secretary himself—with the added and fatal disadvantage of giving to the new incompetent, authority over men technically educated and fully competent.

The vital principle that every important business should be conducted by an expert in that business is, in this case, ignored. Either course would, in the opinion of those most competent to judge, insure inefficiency in the operation of the naval service, of that arm on which the nation most relies to defend its honor and its rights in conflict with a foreign foe. But the most dangerous of foes is the amateur, in the position of an expert, controlling an important branch of public service.

The 'Personnel Bill,' passed by Congress as an emergency measure during the excitement attending the outbreak of the war with Spain, and which consolidates the whole Naval Engineer Corps with the Line of the Navy, seems to have worked a mischief in a similar manner. Amateur talent is entrusted with duties and responsibilities which can only be safely assigned to experts of high scientific education, thorough professional training and ample experience. The members of the old Engineer Corps are dying off and the whole business of engineering is nominally becoming shifted into the hands of line-officers without other than amateur knowledge of the business, and with obvious danger to the whole naval service. Either the law is defective or it is not found practicable to secure its intended results; but, whichever may be the fact, the important outcome is danger of sacrifice of the vital interests of the Navy to amateur incompetence. Nor is there the excuse in lack of knowledge of the danger, in advance. Every report of the chiefs of bureau of earlier years, for a generation past, has included a warning, often earnest and impressive, of this coming danger; while, throughout the whole period, the steady reduction of the numbers of officers in this most vitally important of all divisions of the modern naval personnel has been progressing, and the dangerous change has been advancing toward a crisis, despite the constant warnings, not only of all chiefs of bureau, but of substantially all old members of the wrecked corps.

The constant danger to the Naval Observatory and its personnel through amateurism has been as constant a subject of protest, in the same manner and with no better result; but this introduction of amateurism into the seagoing navy is even more serious and is certain to result in more serious disaster.

R. H. Thurston.

A Record of the Geology of Texas for the Decade ending December 31, 1896. By Frederic W. Simonds, Ph.D., Professor of Geology in the University of Texas—Transactions Texas Academy of Science for 1899, Vol. 3, Austin, Texas, October, 1900.

This work is deserving of more than passing notice for Professor Simonds has not only given a most painstaking and complete bibliography of the geology of the Texas region, but as truly expressed in the title a record of the same. Each of the 466 works noted is accompanied by an intelligent abstract or synopsis, so that this book becomes of greatest value to any one wishing to ascertain information concerning the Texas region for the decade ending with the year 1896. The task of compiling such a work at Austin, so remote from good library facilities, must have been enormous, and is a credit to Professor Simonds, the Texas Academy of Science and the University of Texas.

It is gratifying also to note that this work is but one of the recent manifestations of the quickened and improved condition of the University of Texas. Within the past ten years this institution has been gradually acquiring a faculty of progressive and able men and has made

a steady growth in every department, which places it in the front rank of Southern institutions and equal, if not ahead, of many of the older colleges of the North. Under the administration of President Prather its work is steadily advancing and it is to be hoped that the Legislature of Texas will see the necessity of an enlarged and ample endowment.

ROBT. T. HILL.

BOOKS OF REFERENCE.

WE have received from Messrs. Lemcke & Buechner, New York, the tenth volume of the invaluable year-book of the learned world, 'Minerva,' which is now a volume of 1,235 pages. The frontispiece is an etching of Professor W. C. Röntgen, the other men of science selected for this purpose in previous volumes having been Pasteur, Kelvin, Schiaparelli and Nansen. The editor has been compelled to give up his plan of including in the work data of international congresses, which is regrettable, though the task of securing such information is doubtless difficult. As it is the work contains a vast mass of information—a rough calculation indicates that the names of about 32,000 scientific and learned men, connected with the world's institutions of learning, are included. The statistics of students given at the end show that the universities having an attendance of over a thousand students are distributed as follows: United States, 26; Germany and Austria, 24; Italy, 10; Great Britain and France, 8 each; Russia, 7; Spain, 4; Norway and Sweden, 3; Switzerland, Belgium and Canada, each 2; Denmark, Portugal, Egypt, Brazil, Chili, Philippines, New Zealand and Japan one each.

'WHO'S WHO' for 1901, published in London by the Blacks, and in New York by the Macmillans, is also a useful work of reference, giving as it does short biographies of the leading men and women of Great Britain and of a few Americans. All the leading British men of science are included, and it is interesting to note how many there are and what important work they have accomplished. It is impossible to discover by what principle or lack of principle the Americans have been selected. The provost of the University of Pennsylvania is there, but not the president of Harvard University. Mr. Tesla is included, but not the two or three of our most eminent men of science who have been looked up. The editing of the book appears to be careful, but not perfect. Thus to take a somewhat trivial example, Francis Darwin is said to be the son of 'Charles Robert Darwin,' George Howard Darwin is said to be the son of 'the late Charles Robert Darwin (author of the 'Origin of Species,' etc.)' and Leonard Darwin is said to be the son of 'the celebrated Charles Darwin, Down, Kent.' The 12,000 biographies, more or less, which the volume contains are certainly most useful for reference. In this connection it may be stated that a new edition of the American 'Who's Who' is in preparation, and the editor Mr. John W. Leonard, care of A. N. Marquis & Co., Chicago, will be glad to secure corrections and additions to the last edition.

BOOKS RECEIVED.

Practical Electro-chemistry. BERTRAM BLOUNT. New York, The Macmillan Company; London, Archibald Constable & Company. 1901. Pp. xi + 374.

Electricité et Optique. H. POINCARÉ. Paris, Georges Carré and C. Naud. 1901. Pp. ii + 641.

The Bird Book. FANNIE HARDY ECKSTORM. Boston, D. C. Heath & Company. 1901. Pp. xii + 276. $.60.

Elevation and Stadia Tables. ARTHUR P. DAVIS. New York, John Wiley & Sons; London, Chapman Hall, Limited. 1901. Pp. 43.

Laboratory Instructions in Chemistry. ERNEST A. CONGDON. Philadelphia, P. Blakiston's Son & Company. 1901. Pp. viii + 110.

Studien über den Milchsaft und Schleimsaft der Pflantzen. HANS MOLISCH. Jena, Gustav Fisher. 1901. Pp. viii + 111.

Die Reizleitung und die reizleitenden Strukturen bei den Pflanzen. B. NEMEC. Jena, Gustav Fisher. 1901. Pp. 153. Tafeln 111.

Seventeenth Annual Report of the Bureau of American Ethnology. J. W. POWELL. Washington, Government Printing Office. 1898. Part II. Pp. 752.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Botanical Gazette* for January, 1901, contains a second contribution by Professor C. S. Sargent, 'On New or Little Known North American Trees.' This special fascicle of descriptions

includes a new honey locust from Texas and eight new species of *Crataegus*. Mr. Theo. Holm contributes an 'Anatomical Study of *Eriocaulon decangulare* L.,' from which he concludes that this genus and its allies are somewhat unique among the monocotyledons. Mr. B. M. Duggar, of Cornell University, records the results of 'Physiological Studies with reference to the Germination of certain Fungous Spores.' The number closes with the usual book reviews, notes for students and news items.

THE February number of *Popular Astronomy* contains an article by R. G. Aitken, of Lick Observatory, on the 'Orbit of Sagittarii,' accompanied by a plate of the orbit; the second part of Mr. How's article on the 'Best Astronomical Books for the Use of Students' takes up historical and biographical works in detail; J. F. Lanneau contributes notes on the eclipse, and Asaph Hall a note on 'Clairaut's theorie de la figure de la terre.' J. K. Rees, of Columbia Universitory Observatory, presents a full report of the observations on the November meteors during the years 1898, 1899 and 1900. An abstract is also given of the article by Kretz on the 'Star Coma Berenices' and a full account of the recent reports of the Board of Visitors of the Naval Observatory. An article by Professor W. W. Campbell shows how the observations of Eros will determine the sun's distance from the earth and a résumé of the scientific progress of the nineteenth century closes the general department of the number. In addition to the usual notes a new department is opened which gives news of 'Double-Stars, their Observations and Observers.'

SOCIETIES AND ACADEMIES.

SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN.

THE December meeting of the Science Club of the University of Wisconsin was addressed by Dr. C. R. Van Hise on the topic, 'The Earth's Story of the Ore Deposits.' This address, which was delivered to a large audience, treated in a briefer and simpler manner a subject which has recently been given an exhaustive treatment in addresses before the American Institute of Mining Engineers and the Western Society of Engineers, and which under the title, 'Some Principles controlling the Deposition of Ores' has been printed in the *Transactions* of the first-mentioned Society. The thoroughness of Professor Van Hise's investigations, which, starting on different lines, have converged upon a common point, set to rest many hitherto controverted questions and, from an application of newly determined principles in the fields of physical chemistry, applied mathematics and soil physics, as well as in geology, there has been evolved a theory of ore deposition which is both logical and in accord with observed facts. The theory may be said to be grounded on two important earlier investigations: one by Van Hise, showing that at the moderate depth of 20,000 meters all save the smallest cavities must close in even the hardest rocks, whereas in most rocks they must close at one-half that depth, and one on Slichter's elaborate investigation of the flow of underground waters, an investigation which has been considerably extended by Van Hise.

From the first-mentioned study it follows that the circulating waters, which it is almost universally admitted deposit the ores from solution, could not have come from below the depth of 20,000 (or perhaps 10,000) meters. The excessive friction of liquids moving in capillary tubes, and the consideration that probably 100,000 times as much liquid as ore must be transported seem to exclude the possibility of ascensional currents below this level, thus restricting their circulation to the thin outer shell of the earth's crust—*the zone of fracture*. This requires that the circulating water shall be of meteoric origin, and the fundamental premise is made that the motion of the waters is a result of gravitative stress.

Water flowing under head from one point to another through a homogeneous medium will utilize the entire cross-section (indefinitely extended), though the major portion will pass by the shortest route. If vertical fissure planes exist in the course of the liquid the lines of flow will be deflected so that above a certain point they will enter the fissure in a downward direction and below another point they will be di-

rected upward, while between the two points they enter laterally. It follows from this that a particular body of ore may have been formed by ascending, descending or laterally moving currents, or by any or all combined.

The level of ground water separates an outer *belt of weathering*—a belt in which oxidation, carbonation and hydration are producing soluble bodies—from an underlying *belt of cementation* in which deposition is continually taking place, often in connection with solution. In many mining regions the processes of degradation have removed several thousand meters of rock from above the present belt of weathering, but as the belt removed has all at some time been included within the belt of weathering, it is an adequate storehouse from which the ore bodies of the present belt of cementation have been supplied. Another fundamental premise is that materials will be more generally taken into solution during the descending course of waters and be deposited during the upward course toward the surface, both because the increasing pressure and temperature with increasing depth favor solution, and because the larger fissures near the surface—the trunk channels—allow the mingling of solutions. Since the same fissure may near the surface be receiving descending waters, a little lower down laterally moving currents, and at still greater depth ascending currents, it follows that as degradation brings successively lower and lower belts within the realm of action of ground waters, the first concentration of ores will, in general, be produced by ascending currents and the later concentrations (if there be any) by laterally moving or descending currents. The first concentration should be less in amount than later concentrations, a conclusion which is supported by observation, since nine mines out of ten are poorer below the 300 meter level than above it, and still poorer below the 600 meter level. Inasmuch as the deep water circulation is deficient in oxygen but contains reducing agents, while the shallow water circulation contains free oxygen, it is easy to explain the development of oxide ores in the belts near the surface. Dr. Van Hise holds that oxidized salts, such as sulphates, carried to greater depths, react upon the lean sulphides so as to precipitate the metals as sulphides from the solution. The above are only the broader generalizations in the earth's story of the ore deposits as read by Professor Van Hise.

WM. H. HOBBS.

THE TEXAS ACADEMY OF SCIENCE.

DURING the quarter ending December 31, 1900, there have been three noteworthy meetings of this organization. At the first, held in the Chemical Lecture Room of the University of Texas, Friday evening, October 26th, Dr. Simonds, the retiring President of the Academy, introduced his successor, Henry Winston Harper, M.D., F.C.S., who then delivered the Presidential Address, his subject being 'Some Advances in our Knowledge of Immunity and Protective Inoculation.' This address will be published in full in SCIENCE.

The second meeting of the quarter was held in the Chemical Lecture Room of the University, Friday evening, November 23, 1900. The program was as follows:

1. 'The Present Foundation of the Austin Dam,' by Professor T. U. Taylor, University of Texas.
2. 'An Application of the 57.3 Rule,' by Professor T. U. Taylor.
3. 'Eros and the Solar Parallax,' by Dr. Harry Y. Benedict, University of Texas.

The third and last meeting was held at Baylor University, Waco, Texas, December 28–29, 1900. The program was of unusual interest and covered a wide range.

1. 'The problem of Forest Management in Texas,' by Dr. William L. Bray, University of Texas.
2. 'Recent Progress in Insect Warfare' (by title), by Professor F. W. Malley, Agr. and Mech. College of Texas.
3. 'The Value of Coal Tar Products as Practical Wood Preservers,' by Instructor E. P. Schoch, University of Texas.
4. 'A Mathematical Problem,' by Professor J. B. Johnson, Baylor University.
5. 'The Cretaceous—the Kindergarten of Paleontology,' by John K. Prather, B.S., Waco.
6. 'The Silt Problem in connection with Irrigation Storage Reservoirs,' by Professor J. C. Nagle, Agr. and Mech. College of Texas.
7. 'The Need of Technical Education in the South,' by Dr. William T. Mather, University of Texas.
8. 'The Modern Presentation of Botany,' by Instructor A. M. Ferguson, University of Texas.

9. 'Note on the Occurrence of Mammoth Remains in McLennan County,' by Professor O. C. Charlton, Baylor University.

10. 'The Hydrographic Survey of Texas,' by Professor T. U. Taylor, University of Texas.

11. 'Theorem concerning Centers of Curvature of a Roulette' (by title), by Dr. M. B. Porter, Yale University, New Haven, Conn.

12. 'On the Floral Provinces and Vegetative Formations of the West Texas Region' (by title), by Dr. William L. Bray, University of Texas.

FREDERIC W. SIMONDS,
UNIVERSITY OF TEXAS. *Secretary.*

ENGINEERING ASSOCIATION OF THE SOUTH.

THE regular monthly meeting of the Association was held on the evening of January 10th, at Vanderbilt University.

The death of Maj. Niles Meriwether, President of the Association was announced, and Messrs. J. S. Walker and Hunter McDonald were appointed a committee to prepare a memorial sketch of his life. The Association will feel most keenly this loss, for Maj. Meriwether has been a most active member.

A communication from Mr. J. C. Truatwine, Jr., Secretary of the 'Journal of Association of Engineering Societies,' was read. After some little discussion it was the unanimous opinion that the continuance of an individual publication was far preferable to uniting with the 'Journal of the Association of Engineering Societies,' and the Secretary was instructed to so notify Mr. Truatwine.

The first paper was a description of the methods of doing some bridge pier and foundation work in Chemulpo, Korea, by W. H. Holmes, an American engineer who has recently returned from that country. The system of keeping records of rivers in that ancient country was briefly described. They extended back into the past for many centuries and are said to be very accurate. Mr. Holmes stated that where an opportunity offered itself for a check the records were in every case sustained. The record for the river in question extended back 509 years and explanation was made at the beginning of the records that the history of the river previous to that time had been consumed in a fire which had burned the house and all contents.

The second paper was presented by Mr. Julian W. Kendrick, city engineer of Birmingham, Ala. It was an exhaustive study of the sewerage problem now confronting the Birmingham district. The geographical features of the drainage area were described, the difficulties in carrying out the various methods of sewerage set forth,and finally a plan proposed. The paper had been carefully prepared and was an interesting contribution on the sewerage question.

H. M. JONES,
Secretary.

VERMONT BOTANICAL CLUB.

AT the annual winter meeting of the Club on January 25th and 26th the following program was presented:

'The Finding of a Plumose Variety of *Asplenium ebeneum*,' by Mrs. Frances B. Horton.

'Some Common Confervæ,' by T. F. Hazen, Columbia University.

'Some Interesting Mosses Collected in Vermont in 1901,' by Dr. A. J. Grout, Boys' High School, Brooklyn.

'Are there Two Kinds of Hemlock in Vermont'? by Elroy C. Kent:

'Note on *Tremella mycetophila* Pk.,' by Dr. E. A. Burt. Middleburg College.

'Notes on the Last Season's Botanizing,' by Mrs. Nellie F. Flynn.

'Report of Progress on the Maple Sap Problem,' by A. B. Edson, University of Vermont.

'The Flora—What Next?' by Clifton D. Howe, University of Vermont.

'The Present Status of Vermont Botany,' by President Ezra Brainard, Middleburg College.

'A Botanical Trip to Joe's Pond,' by Mrs. Carrie E. Straw.

'Botanizing in the Bermudas,' by Dr. M. A. Howe, Columbia University.

'What Text-book of Botany shall be used in the High School?' by Miss Phoebe Towle.

'Wild Violets in the Garden,' by Miss E. Mabel Brownell.

'Are the Equisetums or Ferns Poisonous?' by Professor L. R. Jones, University of Vermont.

C. D. DIXLOWE,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A BIBLIOGRAPHIC CATCH TITLE FOR EVER AND EVER.

PROFESSOR MARK'S method of referring to bibliographic lists by name of author and number of year is worthy of general adoption; but it is not surprising that a difficulty should be

met with when an attempt is made to depart from the principle of the method by the introduction of an arbitrary symbol. Professor Mark (SCIENCE, January 4, 1901) proposes that the sixteen hundreds shall be denoted by 1600, etc., the seventeen hundreds by 1700, etc., the eighteen hundreds by '00, etc., and the nineteen hundreds by :00, etc. This method could be of value only if accepted universally, or at least by all scientific writers. The confusion introduced by inadvertently writing '23 for 1923 will be as great as if one had actually written 1823. But is it likely that this confusion will be avoided, seeing that many people already have dated letters and so forth '00 or '01, meaning 1900 and 1901? Setting this objection aside for the present, we note what difficulty Professor Mark has in finding a suitable symbol for the nineteen hundreds, and we wonder what is to be done with the next century, and with the one after that, and so on. If we are to settle this question in a scientific spirit, let us attempt something better than an apostrophe for 18, a colon for 19, a hyphen, say for 20, a dagger for 21, and such arbitary methods, all for the sake of saving an *em* space here and there or a few tenths of a second *per annum*. The irritation induced by the constant repetition of 18 or 19 is the least of the penalties we have to pay for the possession of ten fingers, and it is hardly enough to induce us to attempt yet once more some new method of notation. I therefore dismiss as impracticable all suggestions that familiar numerals should arbitrarily or even with some show of reason be replaced by punctuation marks, or by letters of any alphabet, or by ideographs, or by musical notes. But, seeing that the majority of papers referred to by any writer are, and in most cases will be, those of the hundred years immediately preceding the date of his own writing, I suggest that the apostrophe should be used, by those who like such self-saving devices, for all those years and for them alone. Professor Mark when he wrote in 1899 used the apostrophe for all the years 1800 to 1899. In 1901 let him use it for the years 1802 to 1901; in 1923, if, as we hope, he be still active, let him use it for the years 1824 to 1923. This plan seems to be more in accord with general usage. 'Who fears to speak of '98'? did not cease to be intelligible to everyone, until the year '98 again came round. For all years more than a hundred back, or in any case of doubt, let us use the full number; and more particularly should it be used in the dating of important letters, of publications, and of formal entries in museum registers, or similar volumes of permanent historic importance.

F. A. BATHER.

NATURAL HISTORY MUSEUM,
LONDON, ENGLAND.

A FURTHER APPEAL TO ALL LOVERS OF BIRDS.

ONE year ago all the sea birds breeding along our coasts seemed doomed to extinction at the hands of the milliners, in spite of their beauty and incalculable services as scavengers, and as guides to fishermen and mariners.

The American Ornithologists' Union, alarmed at the prospect, appointed a special committee to devise means for the preservation of these birds. This committee, aided by the press, appealed to the bird-loving public for funds with which to hire wardens to guard the sea birds while they were on their breeding grounds.

The contributions received in response to this appeal were sufficient to secure faithful wardens for the protection of all the colonies still left on the coast from Cape Charles, Virginia, northward to Maine.

The encouraging results of the efficient protection given the birds during the season of 1900 prompts the American Ornithologists' Union to continue its efforts during the coming breeding season and to extend, if possible, the work to the South Atlantic and the Gulf coasts, where there is even greater need of bird protection than in the north.

At the last session of Congress a Federal law was enacted, known as the Lacey Act, which gives by far the strongest protection ever furnished to bird or beast in the United States, as it makes it a punishable offense to export from a State any bird or animal unlawfully killed therein, or to receive such bird or animal in any other State. The common carriers are even now refusing to transport birds and animals in view of the heavy penalty attached to a violation of the Lacey law. It is believed by the committee that the vigorous enforcement

of this law by the United States Department of Agriculture, which has the matter in charge, and the proposed extension of the warden system, will in a very short time break down the whole plume trade so far as it lives upon the birds of the United States.

In addition to the special protection given to the birds by wardens, the American Ornithologists' Union, through its Protection Committee, is taking very active steps in a large number of States to improve the bird laws by amendments, or through the enactment of entirely new and effective statutes.

In view of the urgent need for a continuance of the work, and of the encouraging results of the first year's systematic efforts, the undersigned committee of the Union feel justified in making a second urgent appeal to every bird lover, and to every one who desires the preservation of these beautiful and economically valuable birds, to contribute to the fund necessary for continuing the work on a more extended scale.

Contributions should be sent to the treasurer, Mr. Wiiliam Dutcher, No. 525 Manhattan Avenue, New York City.

[Signed.] Abbott H. Thayer; William Brewster, President Mass. Audubon Society; Witmer Stone, Chairman A. O. U. Com. on Bird Protection; Robert Ridgway, Curator of Birds, U. S. Nat. Mus.; C. Hart Merriam, Chief U. S. Biological Survey, Pres. A. O. U.; A. K. Fisher, Ass't Biologist, U. S. Biological Survey; J. A. Allen, Curator Vertebrate Zoology, Am. Mus. Nat. His; Frank M. Chapman, Ass't Curator Ver. Zoology, Am. Mus. Nat. His.; William Dutcher, Treasurer, A. O. U.

SHORTER ARTICLES.

THE PROPER NAMES OF THE ALPINE CHOUGH AND OF THE EGYPTIAN CROCODILE.

In a recent number of Science attention was called to some names of animals proposed by Osbeck (*Reise nach Ostindien und China*, 1765), which had been overlooked by subsequent writers and should replace several names in common use. Since then I have had the opportunity of examining a copy of the German translation * of Hasselquist's *Iter Palæstinum eller Resa til Heliga Landet, etc.*, 1757; and among the many interesting questions of synonymy that are opened by this book there are two to which I desire to call attention at the present time, viz., the proper names of the Alpine Chough and of the Egyptian Crocodile.

In the first edition (1757) of Hasselquist that author describes the Alpine Chough as *Monedula pyrrhocorax* (p. 238), which was referred to the genus *Upupa* by Linné in his *10th edition* (1758), and subsequently, in the *12th edition* (1766), described as *Corvus pyrrhocorax*. As the German translation of Hasselquist's work appeared in 1762, in which the name *Monedula pyrrhocorax* occurs with a full description on pages 238, 239, that author must be credited with first removing the Alpine Chough from *Upupa*, and restricting it under the name *Monedula pyrrhocorax* which is the proper name of the bird. Several changes in the synonymy of the species are necessary which should stand as follows:

Monedula pyrrhocorax (L.) Hass.
Upupa pyrrhocorax Linné. 1758.
Monedula pyrrhocorax Hass. 1762.
Corvus pyrrhocorax Linné. 1766.
Pyrrhocorax alpinus Viell. 1816.
Pyrrhocorax pyrrhocorax (L.) Temm. 1820.

Monedula Brehm (1828), being preoccupied by *Monedula* Latr. (1802), has been replaced by *Colœus* Kaup. Latreille's generic name must likewise fall in view of Hasselquist's prior use of *Monedula*.

The use by Hasselquist of Linné's name, *Lacerta crocodilus*, for the Egyptian crocodile has an important bearing as to the proper name of that animal. The *Lacerta crocodilus* of both editions of Linné was a composite species, and for that reason the name has been dropped by recent writers, the Egyptian species generally carrying the name *Crocodilus niloticus* Laur. 1769. It seems evident that its proper name is *Crocodilus crocodilus* (Linné), 1758, in consequence of Hasselquist's restriction of *Lacerta crocodilus* to the Egyptian animal in 1762.

I am indebted to Mr. Witmer Stone for suggestions regarding the synonymy of the Alpine Chough.

William J. Fox.
Academy of Natural Sciences,
Philadelphia.

* 'Reise nach Palästina.' Rostock, 1762.

THE WOOD BUFFALO.

THE following information has just come into my possession from the Inspector of Indian Agencies and Reserves, Mr. J. A. Macrae, who has recently returned from the far north. He writes: "At Fort Chipewyan, Fort Smith and Fort Resolution, I made close enquiries into the number of wood buffalo remaining, having an opportunity—owing to meeting so many Indians fresh from their grounds—such as I think no one else has enjoyed, to do this. Some of the Indians who were to meet me at each place had lately been near the Buffalo and had counted the different herds, which are generally speaking, three in number—one ranging from Salt River to Peace Point on Peace River; one from Salt River north to Great Slave Lake; and one from Salt River east and west. They number, I conclude, from 500 to 575. I understand that there has been an increase of perhaps a couple of hundred, and it would appear only to be necessary to continue vigorous protective measures in order to perpetuate the herd. It is noticeable that the fur of the wood Buffalo, owing no doubt to climatic conditions, is longer and thicker than was that of its brother of the plains, and it has that straightness and thickness which characterized the musk ox robe."

OTTO J. KLOTZ.
DEPARTMENT OF THE INTERIOR,
OTTAWA, CAN.

CURRENT NOTES ON METEOROLOGY.

THE 'BOOM' POPULATION OF KANSAS.

SOME interesting facts concerning the change in the number of inhabitants of Kansas as a result of the rise and collapse of the 'boom' of the latter part of the decade 1880–1890, are given by Gannett in an article on 'The Population of the United States' in the last number of the *Bull. Amer. Geog. Soc.* (No. 5, 1900). It will be remembered that a succession of unusually rainy seasons at that time was followed by a large increase in land values, the whole region witnessing a tremendous 'boom.' There was a rapid gain in population. A number of dry seasons following, the settlers were literally starved out, and the country was quickly depopulated again. In 1885, at the beginning of the 'boom,' Kansas had a population of 1,268,530; in 1888, near its crest, the population numbered 1,518,552; in 1890 the figures were 1,427,096, and in 1895 only 1,333,734. The State thus gained nearly 250,000 inhabitants in three years, and later lost nearly 200,000. Similar conditions obtained in Nebraska and the two Dakotas.

THE METEOROLOGY OF LOWER CALIFORNIA.

IN an article on 'Explorations in the Central Part of Baja California,' in the *Bull. Amer. Geog. Soc.* (No. 5, 1900, 397–429), Dr. Gustav Eisen gives a brief account of the rainfall and climatic conditions of the meteorologically practically unknown peninsula of Lower California. There are two sources and two seasons of rainfall. The summer rains extend from Todos Santos and Cabo San Lucas, in the south, as far up as the Sierra Nevada, in the northern part of Alta California. These summer rains are most frequent and heavy in the backbone of the Sierra which runs along the eastern coast of Baja California. The winter rains now and then extend from Alta California down to the Pacific Coast, even as far south as San José del Cabo. These winter rains never enter the Gulf of California, and diminish in quantity and regularity to the south. As far south as San Quentin they are fairly regular, but beyond that point they are uncertain. In spite of these two sources of supply, the peninsula of Lower California is but very scantily supplied with rain.

THE HARVARD METEOROLOGICAL STATIONS IN PERU.

THE 55th Annual Report of the Director of the Astronomical Observatory of Harvard College contains an announcement which will fill meteorologists the world over with regret. Speaking of the meteorological stations of the Harvard College Observatory in Peru, concerning which mention has frequently been made in the columns of SCIENCE, Professor Pickering says: "The observations at these different stations have now been continued in many cases for eight or ten years. At such stations, where, from the necessities of the case, the observers are generally men of limited educa tion and experience, observations of the greatest accuracy cannot be expected, except by maintaining trained observers at greatly in-

creased expense. * * * Taking into consideration the striking uniformity of conditions which prevail in different years in this region, it is probable that additional observations would not greatly increase our knowledge. It has been decided, therefore, to suspend, at the end of the year 1900, the meteorological observations of all the stations, except those at Arequipa."

RECENT PUBLICATIONS.

C. F. MARVIN: *Anemometry.* U. S. Department of Agriculture, Weather Bureau. Circular D, Instrument Division. 2d Edition. Washington, D. C. 1900. 8vo. Pp. 67.

This is a circular of general information respecting the theory and operation of instruments for indicating, measuring and automatically recording wind movement and direction, with instructions for the erection and care of such instruments of the Weather Bureau pattern.

C. F. MARVIN: *Psychrometric Tables for Obtaining the Vapor Pressure, Relative Humidity and Temperature of the Dew Point.* U. S. Department of Agriculture, Weather Bureau. Washington, D. C. 8vo. 1900. Pp. 84. Price, 10 cents.

These are the tables for the reduction of the psychrometric observations at the regular and volunteer stations of the Weather Bureau. The use of these tables began Jan. 1, 1901.

NOTES.

DR. H. R. MILL has become the Editor of *Symons's Monthly Meteorological Magazine*, in place of Mr. H. Sowerby Wallis, who has held that position since the death of Mr. G. J. Symons.

ACCORDING to Professor A. J. Henry (*Monthly Weather Review*, Oct. 1900), a conservative estimate of the total loss of property by lightning in the United States during the year 1899 would probably be $6,000,000.

R. DEC. WARD.

THE NAVAL OBSERVATORY IN CONGRESS.

THE Observatory was discussed in the Senate on January 22d in view of an item in the naval appropriation bill. Mr. Morgan said:

I want to call the attention of the Senate to the fact that this great Observatory is without any real organization in law, and it is a haphazard, piecemeal sort of arrangement by which it has been put under the Navy Department. It was first called the National Observatory of the United States. It was afterwards called the Naval Observatory of the United States, and was put under the Navy Department. No head or management of the Observatory, as I understand it, has ever been appointed or given the direction of it, but an officer of the Navy is detailed to take charge of the Observatory from time to time, who controls this matter. However, it is not a military office in any sense of the word, and it does not follow that a man educated at Annapolis has any very special training in astronomy. It seems to me that that great institution is very badly crippled for want of a proper organization.

We have here, upon the recommendation of what is called the chief astronomer, a provision by which an assistant spectroscopist is to be appointed, and yet they have made no reports recently of any work of that kind in the Observatory. I suppose there must be work of that kind going on, but the reports ought to show it if they are of any value at all

Now, this great Observatory, perhaps the largest national observatory in the world—I think it is the largest one in the world—not larger, perhaps, though more costly, than some of the private observatories—has cost the Government of the United States for the site, buildings, grounds, and outfit $655,845, and the roads, pathways, and gradings, $95,900, making a total cost of $751,745.

As I understand it, the Observatory does not have the rank amongst the observatories of the United States that it ought to have. There is very valuable work done there, a great deal of it, no doubt, but simply for the want of proper organization the work has not been conducted in the way it ought to be. I have introduced a bill in the Senate to organize the Observatory, for it has never had any organization.

I wanted to call the attention of the chairman of the committee to this particular appropriation, with a view of drawing out some expression from him, or from some one who is informed particularly on the subject, about certain points. Congress, it seems, has neither defined the objects for which the Observatory was founded, made any provision for its control, or appointed any authority to determine what it should do or to report upon its work, nor assigned to it any public function. What the Navy Department has been able to do is to provide for its government as a naval station, appoint an officer to command it, detail professors in the Navy for duty, give to the senior of these professors the title of astronomical director, and charge him with the duty of determining what astronomical work shall be done. But, as far as known, it has never been able to provide the head of the es-

tablishment, or the astronomical director, with any instructions or suggestions as to what the Observatory should do.

I am willing that this assistant spectroscopist shall be appointed and that he shall have the salary proposed to be paid under this proposed act at the present time, because it seems that everything which is suggested here by a naval officer who is connected with the Observatory goes without any regulations of law at all. There is no law to regulate the National Observatory.

Mr. Chandler said :

When the naval appropriation bill comes up I hope the Senator will aid myself and the committee in securing some appropriate legislation to improve the management of the Observatory ; but it is not proposed by that bill to take the Observatory wholly away from naval control. It is proposed to establish a permanent board of visitors, on which shall be some of the most eminent astronomers, and also to make the astronomical corps a corps of civil officers, instead of a corps of life officers in the Navy. There are other incidental improvements of administration which are recommended. I hope there will be some legislation on the subject.

There is not, I will add, perfect satisfaction among the astronomers of the country with the work of the National Observatory ; and it was that dissatisfaction which led to the appointment of this board of visitors.

The subject is worthy of the very careful consideration of the Senate and of Congress.

Mr. Allison said in reply to Mr. Morgan :

I agree with the Senator that it may be necessary to reorganize the Naval Observatory. That has been in contemplation for some years.

On January 25th the same question was raised in the House, sitting as Committee of the Whole in connection with an item in the naval appropriation bill, appropriating $18,000 for the building of three houses for the astronomers of the observatory. Mr. Newlands said :

I would like to ask the gentleman from Illinois whether he has any views in regard to the taking of this observatory out of the control of the Navy Department? My information is that it is really of no scientific value to the country or to the world, and that the observatory would be much better administered by some other department of the Government, with really scientific men at its head, instead of naval officers detached for duty there.

Mr. Cannon. The gentleman asks me a question of policy that is not necessarily connected with the building of these houses. I would say to my friend that no doubt my friend from West Virginia would not agree with me. I do not believe, to answer his question, that the Astronomical Observatory ought to be under the control of the Navy or the Army or any other department in Washington. I think that we should have better administration and more economic administration if we were rid of that expensive house out there [the superintendent's house] under a direction that does not direct in scientific lines.

Mr. Newlands. I wish to state to the gentlemen that I understand that the naval observatory in England is of great scientific value, not only to that country but to the world, for the reason that the men in charge of the observatory are trained scientific astronomers and not naval officers. Now, I would call his attention to that and ask him whether it is not advisable that this entire department of the Government be placed under scientific control, with a view to the advance of scientific information.

Mr. Cannon. I will say to my friend now, if he will not call on me for names, because I do not like to give these in a city of official direction—I will say to him that men who have been in the service, scientific men, astronomers of this Naval Observatory, and men I apprehend that are in its service now, have protested to me time and time and time again that it was not so efficient as it ought to be ; that it was under a direction that was not in harmony, but that with less expense more efficiency could be had.

Subsequently Mr. Dayton described in some detail the work of the Board of Visitors to the Observatory of which he was a member. He said :

We went over, as far as was possible, as thoroughly as possible, the condition of the Naval Observatory and its management and its cost, and the result of our investigation is embodied in the report which I hold in my hand. We took occasion to investigate its history from start to finish and its management from start to finish. In addition to that, in order that there might be full and complete information presented to Congress and the country, certain questions set forth in this report were sent to almost every astronomer of reputation in the country.

Among those questions was one whether or not this Observatory should be transferred from the Navy Department to some other department, whether its efficiency would be promoted by such transfer, and whether, if such transfer was made, with what Department this Observatory should be connected. The answer to these questions presented an anomalous state of affairs. There was an absolute division of opinion that was nearly equal. For instance, my recollection is that 19 of the prominent astronomers suggested thought it ought to be disconnected from

the Navy Department, and 19 said no; but when it came to their suggestions as to what department it should be connected with, if disconnected from the Navy Department, the disagreement was enough—not to speak too lightly—to make any man's head ache.

There was almost as wide a divergence of opinion as opinions expressed. Some suggested the Treasury Department, some suggested the Geological, some the Interior Department, and some the Smithsonian Institution. Many thought—and I am sure the gentleman from Illinois would not be in favor of it—that it was immediately necessary to establish a new department of the Government, that of a department of science, and for the appointment of a secretary of that department, in order that this Bureau and this Observatory and one or two others might be connected with it and embodied in one institution. Others suggested that it was necessary for the Government in order properly to administer the Observatory to establish a national university.

This board, composed, as I say, of a member of the Senate and a member of the House and these three representative astronomers, after considering the whole matter from one end to the other, reached the conclusion that in the absence of the department of science or of the national university the management of the Observatory could be and would be as properly carried out under the control of the Navy Department as any other and at a probably less expense than any other.

Now, as I stated a moment ago, the Observatory work is done, as far as the executive head is concerned, by an officer detailed from the United States Navy, but who does not have control of the astronomical work. To a certain extent he is the head of the Observatory, but the responsibility for the astronomical work is placed upon the astronomical director.

The question whether or not it would be better for the head of the institution to be an astronomer, either from civil life or from the corps of mathematics, is one which can not in this connection be determined. But, so far as the scientific work is concerned, I am satisfied that it is now being well done; and I want to call attention to the fact that in a two-page article in SCIENCE of recent date, criticising Captain Davis's report to the Secretary of the Navy, it is admitted that the work is well done so far as the scientific part of it is concerned.

Therefore, I am sure my friend from Nevada [Mr. Newlands] will not hereafter desire in any way to do injustice to an institution of this country which may stand at the head, and should stand at the head, of all similar scientific institutions throughout the world.

SCIENTIFIC NOTES AND NEWS.

AN American Association of Pathologists and Bacteriologists was formed at a meeting held in New York on January 26th. The following officers were elected: *President*, Dr. W. T. Councilman; *Secretary*, Dr. H. C. Ernst; *Treasurer*, Dr. Eugene Hodenpyl. The first regular meeting of the Society will be held in Boston on April 5th.

ON the occasion of the retirement of Sir Archibald Geikie, F.R.S., of the Geological Survey of Great Britain and Ireland, he will be entertained at a dinner and presented with an address.

AMONG the honors conferred on the occasion of the bi-centenary of the Prussian monarchy is the patent of hereditary nobility to Dr. Emil Behring, professor of hygiene and the history of medicine at Marburg.

WE learn from *Nature* that the Manchester Literary and Philosophical Society has awarded the Wilde medal for 1901 to Dr. Elias Metchnikoff, of the Institut Pasteur, Paris, for his researches in comparative embryology, comparative anatomy, and the study of inflammation and phagocytosis; and the Wilde premium to Mr. Thomas Thorp, for his paper on grating films and their application to color photography, and other communications made to the Society. The Dalton Medal for 1901 has not been awarded.

THE Maximillian order for science and art of Bavaria has been conferred on Dr. Hugo Seeliger, professor of astronomy in the University at Munich.

PROFESSOR R. BLANCHARD, who for twenty-three years has filled the position of secretary to the Zoological Society of France, has presented his resignation to take effect on the twenty-fifth anniversary of the foundation of the Society. On this occasion a commemorative medal will be conferred on Professor Blanchard in recognition of his great services to the Society.

MR. W. H. DINES has been appointed president of the Royal Meteorological Society, London.

PROFESSOR GEORGE E. HALE, of the Yerkes Observatory, gave an address before the Boston

Society of Arts on January 31st, on 'Astronomical Photography with the Great Visual Telescope of the Yerkes Observatory.'

DR. C. W. ANDREWS, of the Geological Department of the British Museum, has, on account of ill health, been granted leave of absence for three months, which he proposes to employ in studying the geology of Egypt and the Soudan. It is earnestly hoped that he may be able to return to his excellent work on fossil reptiles and birds.

PROFESSOR W. B. SCOTT, of Princeton University will deliver a course of sixteen lectures before the Wagner Institute in Philadelphia, the first one to be given early in February.

THE officers of the Entomological Society of London have been elected as follows: *President*, the Rev. Canon Fowler; *Treasurer*, Mr. Robert McLachlan, F.R.S.; *Secretaries*, Mr. Herbert Goss and Mr. H. Rowland-Brown; *Librarian*, Mr. George C. Champion; and as other *Members of Council*, Professor T. Hudson Beare, F.R.S., and Messrs. R. Adkin, Charles G. Barrett, William L. Distant, H. St. J. Donisthorpe, Charles J. Gahan, Robert W. Lloyd, Edward Saunders, G. H. Verrall and Colbran J. Wainwright.

THE Geological Society of France has elected the following officers for the year 1901: *President*, M. Carez; *Vice-Presidents*, MM. Haug, van den Broeck, Dereims, Nicklès; *Secretaries*, MM. Gentil, and Pervinquière; *Vice-Secretaries*, MM. Giraud, Mémin, *Treasurer*, M. Léon Janet; *Librarian*, M. Ramond.

WE regret to record the death of Mr. Frederic W. H. Myers, which occurred on January 17th at Rome, where he had gone, we understand, at the invitation of Professor William James. Mr. Myers was an accomplished poet and man of letters, but is best known to the general public for his enthusiastic devotion to the cause of psychical research. Mr. Myers was born in 1843, being a son of the Vicar of Keswick, and was elected Fellow of Trinity College, Cambridge in 1865. Since the establishment of the Society for Psychical Research in 1882, he devoted himself largely to its work, being its honorary secretary. He was one of the authors of 'Phantasms of the Living,' and has left ready or nearly ready for publication a work on 'Human Faculty.'

DR. SEDGWICK SAUNDERS, the medical officer of health and public analysis for the city of London, and the author of numerous contributions to hygiene and public health, died on January 18th, at the age of seventy-six years.

CONSUL GENERAL MCNALLY has reported to the State Department the death of Miles Rock, in Guatemala. Mr. Rock was born at Ephrata, Lancaster County, Pa., October 10, 1840. He was graduated from Lehigh University, in 1868 as civil engineer. From 1868 to 1869 he taught mathematics and mineralogy at Lehigh University. In 1870 went to the observatory at Cordova, Argentine Republic as astronomical assistant to Dr. B. A. Gould. remained in Cordova for three years, mapping the stars of the Southern heavens. From 1874 to 1877 he was employed by the United States hydrographic office, determining latitude and longitude in the West Indies and Central America. In 1878 he was an assistant on the Wheeler survey west of the 100th meridian, determining latitude and longitude, and from 1879 to to 1883 he was assistant astronomer at the United States Naval Observatory at Washington, and observed the transit of Venus at Santiago in 1882.

THE five series of Alaskan birds secured at Point Barrow by Mr. E. A. McIlhenny has been divided into several representative collections. Most of these have now been disposed of, the best ones going to the Academy of Natural Sciences, Philadelphia, to the Hon. Walter Rothschild, Tryng, England, and to the Carnegie Museum at Pittsburg, Pa.

THE Board of Estimate and Apportionment of New York City has approved the plans and specifications of the New York Public Library building, and appropriated $2,850,000 for its erection. This is in addition to the $540,000 already appropriated for the removal of the old reservoir and the building of vaults. The total cost of the library will consequently be $3,390,000. It has been decided to build the library of white marble which adds about $400,000 to the original estimate.

MR. ANDREW CARNEGIE has offered to give

$50,000 to Lewiston, Me., for a public library on condition that the city will provide a site and $5,000 annually for its support.

THE Detroit Branch of the Archeological Institute of America, held its annual meeting in January. During the past year 64 new members were admitted and the fund contributed to the Institute reached $1,042. The New York and Boston branches are now the only ones surpassing the Detroit branch in membership and activity. The committee, appointed to take steps for an archeological survey of Michigan, was increased to five, with instructions to work for the passage, at the present session of the Legislature, of a bill appropriating $2,500 annually for investigating the antiquities of Michigan.

THE Turin Academy of Sciences will award, at the end of the year, its Bressa prize, of the value of nearly $2,000, for the most important investigation or invention made during the past four years.

THE Röntgen Society, London, offers as a gift from its president, Dr. J. Macintyre, a gold medal to be awarded to the maker of the best X-ray tubes. They must be forwarded to 20 Hanover Square, London, so that they arrive not later than May 1st of the present year.

SOME of the specimens in the Virchow collection in the Pathological Museum of the University of Berlin were destroyed by a fire on January 16th.

IN the House of Representatives, on February 1st, Mr. Southard, of Ohio, chairman of the Committee on Coinage, Weights and Measures, asked unanimous consent to consider a bill to establish a national standardizing bureau. After some discussion it was agreed that the bill should be made a continuing order after the disposal of the bill to promote efficiency of the revenue cutter service.

THE New York State Medical Society, meeting at Albany, has passed the following resolution:

Whereas, Believing that the citizens of the State of New York, and liberal-minded men everywhere, are to be congratulated upon the establishment of the Pathological Institute of the New York State Hospitals, an institution founded for the investigation of the problems connected with insanity and related diseases and unique in the annals of medicine for the greatness of its opportunities, a.d most strongly recommending that the work of investigation for which the Institute was founded be sustained along its present lines of organization and principles of research;

Therefore be it resolved, That we, the members of the Medical Society of the State of New York, respectfully request his Excellency the Governor to sustain the Pathological Institute of the New York State Hospitals; that we beg him to give his support to its growth and development; to protect it against further difficulties, and that we submit to his attention protests against the subversion of the work of the Pathological Institute along the lines laid out by the director, the work being upheld by a wide movement of the medical profession and prominent scientific men of this country and of Europe.

THE Forest, Fish and Game Commission bill introduced into the New York Legislature to carry out the Governor's recommendation, and abolishing the Fish and Game Commission, and turning its powers over to the Forest Preserve Board, was reported favorably in the Senate, amended so as to abolish the Forest Preserve Board, and substitute for the present Forest, Fish and Game Commission, a commission of three similar to the proposed new Prison Commission. One member of the commission will receive a salary which has been fixed at $5,000. The other two will be selected from among the constitutional State officers, one of whom, it is agreed, will be Lieut.-Gov. Woodruff.

At the monthly general meeting of the Zoological Society of London on January 18th, it was stated that there had been 211 additions made to the society's menagerie during the month of December, amongst which special attention was directed to seven specimens of Verreaux's guinea fowl (*Guttera edouardi*), presented by J. F. Walker, of Bulawayo; and to a valuable series of Indian birds lately presented to the society by Mr. E. W. Harper, F.Z.S., of Calcutta, consisting of examples of 20 species all new to the Society's collection. It was further stated that during the past month 20,931 persons had visited the Society's gardens, showing an increase of 6,605 as compared with the corresponding period of 1899.

MR. C. COLERIDGE FARR, in charge of magnetic work in New Zealand, has sent a letter to the editor of *Terrestrial Magnetism* in regard to the magnetic observatory soon to be erected at Christchurch, approximately in latitude 43° 30′ S., and longitude 172° 38′ E. New Zealand will owe this observatory to the labors of a committee, of which Mr. Farr is secretary, appointed at the beginning of last year by the Australasian Association for the Advancement of Science. It will be the most southerly observatory in the world and will have an ideal situation in a magnetically uniform district, except for the possibility of disturbance by electric tramways, which, however, is not likely to occur, for some years and may be prevented altogether by legislation. It is hoped that the observatory will be in operation by the end of this year. Dr. Chree has undertaken the supervision of the construction of the magnetographs by Adie. Mr. Farr invites the various Antarctic expeditions that are soon to leave Europe to make any use they care to of the observatory, and expresses his willingness to give magnetic information or any other assistance. The Lyttelton Harbor Board has offered dock accommodatian to the British National Expedition, and Mr. Farr thinks would doubtless extend the same courtesy of other expeditions. Another result of the labors of the above-mentioned committee is a small appropriation by Parliament to carry out some sort of magnetic survey of New Zealand. The Kew Observatory Committee has aided the work by the loan of a set of absolute instruments, with which observations have so far been made at 100 stations, chiefly in the middle island. In this Mr. Farr was ably assisted by Mr. H. F. Skey.

THE *British Medical Journal* reports that in the Budget of the Italian Minister of the Interior there will be included a sum of money for the prosecution of the campaign against malaria, which has already been begun in various parts of Italy under the influence of the experiments of Professors Celli and Grassi. This money will be devoted by the Government to the carrying out of new experiments and the establishment of prizes. The Italian parliament has before it a bill for the prevention of malaria, by which it would be made compulsory on all employers of labor in malarial districts to make provision for the lodging of laborers with proper precautions against infection in accordance with the present state of knowledge. They would further be compelled to supply remedies gratuitously to laborers who contract the disease until they have recovered their health. They would also have to build suitable dwellings for their laborers and proper lodging places for casual hands, all properly protected against malaria. Loans at 3½ per cent. would be advanced out of the public funds to small proprietors in order to enable them to comply with the obligations placed upon them by the bill. There is a clause exempting from taxation for twenty-five years new buildings erected for industrial purposes in malarial regions. Another clause provides that indemnities at fixed rates are to be paid to sick laborers and to their families by employers who fail to comply with the requirements of the bill.

THE *Evening Post* states that in consequence of the growth of German trade and commerce in all parts of the world, the German Emperor has decided to establish an institute for the study of oceanology, in Berlin, in connection with a naval museum. Both are to be part of the Berlin University, and will serve as an academy for naval instruction on the most modern system and in the widest sense of the word. One of the main objects is the instruction, not only of students in the subjects dealt with, but of all persons interested in them, including ships' captains, ship-owners, merchants, etc. The museum will be formed on a very large scale, the Emperor having ordered that all the naval collections at Wilhelmshaven, Dantzic, Kiel, and Hamburg shall be brought to Berlin, as well as all special collections in other museums, and the greater part of the German naval section exhibited in Paris last year. The Emperor has allotted two hundred and fifty thousand Marks for this purpose, and the Prussian Landtag has also made an appropriation. Though the institutions are still in course of formation, a series of free public lectures on oceanology, etc., by several of the leading German professors will be started at once. The program includes lectures on 'History and the Influence of Navigation,'

'The German Deep Sea Expedition,' 'The Polar Oceans and their Discovery,' 'Astronomy and Navigation,' 'The History and Use of Warships,' 'Oceanology and Navigation,' 'The Influence of Sea Power in History,' etc.

UNIVERSITY AND EDUCATIONAL NEWS.

By the provisions of the will of the late Benjamin D. Silliman, $110,000 will ultimately revert to Yale University and $10,000 to Columbia University. Yale University has also received from an anonymous donor $100,000 for a new building for the medical school and $6,000 from the family of the late Robert Callender, class of 1898, to found a scholarship.

John D. Rockefeller has agreed to give $15,000 each to Mercer College, at Macon, Ga., Carson Newman College, at Mossy Creek, Tenn. and Des Moines College, at Des Moines, Ia., on the condition that each will raise subscriptions of $60,750, to be paid in four annual payments.

The Assembly of the State of California on January 29th passed the bill conferring full corporate powers and privileges on the trustees of Stanford University.

A special committee of the Alumni of Stanford University, appointed last November, reported on January 26th, to a meeting of the alumni at San Francisco on the case of Professor Ross. The Committee calls attention to Professor Ross's pamphlet entitled 'An Honest Dollar' illustrated by political cartoons, published during the campaign of 1896, and states that Mrs. Stanford regarded this as undignified. The report continues:

> The justice of the criticism expressed at the time the pamphlet was published must be deemed to be conceded by Dr. Ross, since it has been admitted by him to your committee that he would not again pursue the same course under similar circumstances.
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> Your committee has been unable to find any evidence that Mrs. Stanford ever took exception to Dr. Ross's economic teachings.
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> That her ultimate demand for his resignation was not due to opinions expressed in his speeches on 'Coolie Immigration' and the 'Twentieth Century City,' but was because she deemed that her original estimate had proved correct and that he was re-displaying, after three years of trial, those qualities found objectionable in the instance of her original action.
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> The admission of Dr. Ross to your committee that he would not regard a university rule against the participation in politics by a university professor of economics during the progress of a political campaign, as impairing the proper right of academic freedom, disposes of his contention that the criticism of his conduct in 1896 is capable of that construction.
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> From the foregoing facts and upon the testimony as a whole your committee concludes that the action of Mrs. Stanford in asking the dismissal of Dr. Ross involved no infringement of the right of free speech.

The London *Times* devotes to the troubles at Coopers Hill College an editorial which begins as follows: "The Secretary of State for India will be guilty of a grave and lamentable error if he is induced by the promptings of official pedants to refuse the demand for inquiry into the recent dismissals at Coopers Hill College, so vigorously pressed in Lord Kelvin's succinct and forcible letter published in our columns on Saturday last. It is well to remember that one of the causes which contributed to the downfall of Mr. Gladstone's powerful administration in 1874 was Mr. Aryton's insolent treatment of men of science. His contemptuous reference to his intellectual superiors, Sir Joseph Hooker and staff at Kew, as 'gardeners' placed a black mark against the name of the First Commissioner of Works of that day which was never obliterated and which drove him out of political life. The man in the street may not understand much about science, but he has a feeling of respect for scientific men who work for small rewards in the interests of truth and knowledge. The public is quick to resent injustice inflicted on a class who have little power of defending themselves and whose services are of enormous and increasing value to national progress."

It is reported in the papers that serious riots have occurred at Kieff University. Conflicts have taken place between the students and Cossacks, in which many of the former were killed or wounded.

Dr. Richard Ewald has been promoted to a full professorship of physiology in the University at Strasburg.